

# *The Brattle Group*

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## **Gas market integration via implicit allocation: Feasibility from the North-West European gas market perspective**

23 April 2012

Dan Harris  
Carlos Lapuerta

**Prepared for**

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NMa

## **Acknowledgements**

We would like to thank the NMa for their cooperation in the creation of this report, and in particular the ideas and contributions of Kick Bruin, Youri van der Drift, Menno van Liere and Marcel Vermeulen.

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## 1 INTRODUCTION AND SUMMARY

Stakeholders in the European gas industry are currently developing a European Gas Target Model (GTM). In essence, the GTM has two objectives. First, to promote the creation of series of harmonised liquid and functional regional gas markets within the EU. Second, to facilitate trading between these regional markets. With regard to the second objective, stakeholders have also been debating the various approaches to cross border capacity allocation.<sup>1</sup> ACER's Framework Guidelines on Capacity Allocation Mechanisms specify that auctions will be the default mechanism for allocating firm and interruptible capacity services for each time interval, with the possible exception of within-day (intraday) capacity services.

Another allocation mechanism that has been discussed is 'Market Coupling' or implicit allocation.<sup>2</sup> Under an implicit allocation mechanism, shippers do not buy cross-border capacity products directly. Rather, the TSO assigns cross-border capacity on the basis of the bids and offers made in the markets on either side of the border. The idea is that the TSO will allocate capacity so as to enable cross border trades which have the largest difference between the price offered to buy gas (the bid price) and the price requested to sell gas (the ask or offer price). This will maximise the gains from trade or welfare.

While implicit allocation is well established for electricity markets, there is almost no experience to date with implicit allocation in gas markets, and the costs and benefits of implicit allocation in gas markets have not yet been proven. Accordingly, in its Gas Target model documents the CEER has invited proposals for implicit allocation pilot-projects that could be conducted to test the costs and benefits of implicit allocation.<sup>3</sup>

The NMa is considering the possibility of implicit approaches to allocation of transmission capacity in European gas markets, in parallel to the plans to carry out explicit auctions, and has retained *The Brattle Group* to analyse the relevant issues.

The report is structured as follows: in section 2 we begin by briefly summarising some of the outstanding issues in EU gas markets, and in section 3 we describe recent initiatives to improve capacity allocation and congestion management. We then go on to describe in section 4 how implicit allocation would work at a high level, and the advantages of implicit allocation as compared to an explicit auction. We also estimate some of the welfare benefits of applying implicit allocation for the Dutch borders. In section 5 we describe the characteristics of EU gas markets relevant to implicit allocation, before going onto describe the main design issues in section 6. Finally, in section 7 we compare and evaluate several alternative implicit allocation mechanisms against each other and explicit allocation.

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<sup>1</sup> See ACER, Framework Guidelines on Capacity Allocation Mechanisms for the European Gas Transmission Network FG-2011-G-001 3 August 2011, section 3.1.1, p.12.

<sup>2</sup> In this report we take Market Coupling to be practically equivalent to implicit allocation, but we understand that there are some contexts in which this may not be the case.

<sup>3</sup> The CEER says that "regulators, Member States, TSOs and market participants should cooperate to conduct pilot projects that design and trial an implicit capacity allocation mechanism between at least two entry-exit zones in different Member States." CEER's Vision for a European Gas Target Model, Ref: C11-GWG-82-03, 1 December 2011, Recommendation 2 p.11. Hereafter referred to as the CEER's GTM paper.

## 1.1 POTENTIAL ADVANTAGES OF IMPLICIT ALLOCATION

We have reviewed some of the proposals put forward by the European Commission and ACER to improve the use and allocation of gas transport capacity. These proposals include over-booking and buy-back, re-nomination limits and firm UIOLI rights, bundling cross-border capacity, long-term UIOLI rules and use of explicit auctions to allocate capacity. While we conclude that many of these proposals will lead to more efficient use of capacity, some issues remain.

We see the main benefit of implicit allocation of cross-border capacity in gas transport as solving a potential co-ordination problem. Absent implicit allocation, a trader could be 'short' on cross border capacity, for example buying gas on one side of the border and selling on the other side before it has obtained cross border capacity. Alternatively, the trader could go 'long' on capacity, by obtaining cross-border capacity before identifying any trades that will use the capacity.

In the first case, the trader might see a potentially advantageous cross-border trade, but be unsure whether to commit to the trade because he/she has not yet secured cross border capacity. This hesitance to trade cross-border will reduce liquidity. In the second case, traders might discount what they are prepared to pay for cross-border capacity in advance of identifying any trades, or else pay too much for capacity relative to its market value. Either outcome leads to distorted signals for cross-border investment.

Implicit allocation avoids this co-ordination problem, because gas trades take place and capacity is assigned simultaneously. Under an implicit allocation scheme, there would be no need to sell the capacity in advance. Implicit allocation also makes some cross-border capacity potentially available to all market participants, via the exchange or capacity allocation platform. This could lead to increased levels of cross-border trade and hence increased liquidity in gas commodity markets. Increased liquidity has a number of benefits – for example gas prices would better reflect actual supply and demand conditions, and result in more efficient decisions regarding resource use. A more liquid gas hub could promote competition in the retail market, by making it easier for entrants to procure gas. In contrast, an explicit capacity allocation mechanism would not solve the co-ordination problem.

To quantify some of the possible benefits of an implicit allocation mechanism, we have looked at how often price differences occur between the Netherlands, Germany and Belgium when there is no congestion on the pipelines. Price differences which occur absent congestion indicate the potential for efficiency improvements from an implicit allocation mechanism. We find that for the period January 2009 to September 2011, there is a remarkable degree of price convergence already between the three price areas. Price differences between the TTF and other hubs are less than €0.5/MWh, or within about 1-2% of one another, for about 70-75% of the time.

We have estimated some of the direct welfare benefits from implicit allocation of capacity relative to the current capacity allocation mechanisms. The estimated welfare benefits per year on both the Dutch-German and Dutch-Belgian borders are in the range of €15-25 million per year – a relatively small number considering that the total value of gas consumed in the Netherlands is about €10 billion. Moreover, this welfare estimate is an upper bound, and we recommend using 50% of the

estimated benefits or a range of €8-13 million for the purposes of cost-benefit analysis. An analysis of cross-border gas flows indicates that the greatest benefits for implicit allocation would occur on pipelines between Germany and Austria, Germany and Belgium and Germany and the Netherlands.

We conclude that while there are potential benefits from the introduction of implicit allocation of cross-border capacity, the problems that implicit allocation will solve in gas markets are less severe than the problems that led to the introduction of implicit allocation in power markets. However, an improved allocation mechanism which led to further price alignment could still have benefits in terms of improving price signals and resource allocation relative to other capacity allocation mechanisms, including explicit auctions.

## **1.2 DESIGN ISSUES FOR IMPLICIT ALLOCATION MECHANISMS**

*Should the implicit allocation mechanism use an exchange infrastructure, that is where trades are cleared? Or should it use bids and offers on the Over The Counter (OTC) markets?*

Use of OTC bids and offers vs. an exchange to implement implicit allocation involves a trade-off. Using the OTC market for the implicit allocation mechanisms would maximize welfare, since there is a far greater volume of bids and offers on the OTC market than on the exchange. In some markets OTC trading volumes are about 500 times greater than exchange volumes, although this ratio varies widely between countries. This means that when allocating capacity using OTC bids and offers the TSOs can be confident of maximizing welfare. The exchange represents only a subset of bids and offers, and therefore may miss some of the most welfare enhancing trades.

On the other hand, average OTC prices and exchange prices on most days are almost identical, suggesting that there would be little loss in welfare from using exchange bids and offers to allocate capacity. Moreover, OTC volumes in power markets are also larger than exchange traded volumes, yet TSOs routinely use exchanges for implicit allocation of electrical interconnector capacity. Moreover, the volume of OTC bids and offers that would be available to the implicit allocation mechanisms is less than the ratio above indicates.

Using the exchanges to allocate capacity implicitly could make it far simpler to automate the implicit allocation mechanism, so that the MO can take a much less active role in the market. Using exchanges would also remove the risk of default by the counter party. The TSOs' role would be limited to making capacity available to the exchanges.

Given the closeness in OTC and exchange prices, and the operational advantages of using exchanges for implicit allocation, we conclude that exchanges would be the preferred platform for implicit allocation using continuous trading.

*Should the implicit allocation mechanism be continuous? Or should it use some kind of dedicated auction platform where the trades used to allocate capacity are made within a defined time period?*

Another option would be to use neither the exchange nor OTC market bids and offers, but instead build a dedicated implicit auction platform. The possible advantage of a dedicated auction platform approach is that it could concentrate bids and offers in markets that are otherwise relatively liquid or

thin. On the other hand, allocating the capacity during a limited time period may not maximise welfare, if more advantageous bids and offers were made later in the day. The most welfare enhancing way to allocate capacity would be to give the capacity to the trades that maximise welfare at any point in time. We conclude that use of a dedicated trading platform to allocate capacity implicitly is unlikely to be attractive option.

*What capacity products should be allocated using the implicit allocation mechanism? For example monthly, weekly or daily capacity?*

Implicit allocation should focus on short-term products, because this is where the co-ordination problem is likely to be most acute and where there is most liquidity. However, we see no harm in also allocating longer term capacity via implicit allocation, as long as a physical transmission product was also available in parallel via an explicit auction process. To ensure efficient infrastructure investment decisions are taken, new capacity should for the most part be underwritten by long-term capacity contracts via an ‘open season’ process, rather than allocated via a short-term implicit allocation mechanism.

Even if we conclude that an implicit allocation mechanisms should focus on short-term capacity products, a related issue is how to divide the total cross-border capacity between for example annual, quarterly and daily capacity products. We conclude that there will be a continuing need for Physical Transmission Rights (PTRs) in the market – it would not be practical to allocate all cross-border capacity via an implicit allocation mechanism. So TSOs will need to develop rules of thumb as to how much capacity it makes sense to dedicate to implicit allocation, given the risk that such capacity imposes on consumers and the opportunity cost of denying this capacity to the longer-term capacity market. Attempting to roughly equalise marginal revenues from the different capacity products would be one possible way to divide up capacity products.

*How should the revenues or rents from implicit allocation be allocated?*

Another design issue is how the revenues or rents from implicit allocation be allocated, which is closely linked to the issue of how the prices for trades associated with implicit allocation would be set. One could design an implicit allocation mechanism to allocate congestion rents either to the TSO or to share the rents between traders. We conclude that the choice of allocation should have no consequences for efficiency, if the sort term capacity that is allocated implicitly is regarded as a sunk cost, and new capacity investments are driven instead by long-term capacity contracts.

*Is a reserve price required for the implicit allocation mechanism?*

Reserve prices, in the sense that the TSOs require a minimum difference between buy and sell bids and offers on either side of the border before they are prepared to allocate capacity, would defeat the purpose of the implicit allocation mechanism. Moreover, reserve prices for the implicit allocation are not required for interconnection points where there is some risk of congestion. Even if the price differences between the markets are often zero, shippers are unlikely to abandon long-term contracts because of the risk of episodes of congestion, and so the TSO will still be able to recover costs.

For interconnection points where there is little or no risk of congestion, the capacity dedicated to the implicit allocation mechanism should be limited to avoid shippers abandoning long-term contracts and stranding the system. Short-term explicit auctions with a reserve price would be required to sell unused capacity. However, there is a risk that the reserve price in the short-term capacity auctions could create price differences between markets, making the implicit allocation mechanisms ineffective.

*Should implicit allocation be an exclusive allocation mechanism for a given product? Or could it and should it work alongside explicit allocation?*

Given that implicit allocation is the most efficient way to allocate short-term capacity, it would seem logical to allocate all short-term capacity via an implicit mechanism. But this is only the case if we are confident that the implicit allocation mechanism has an overview of almost all the available bids and offers in the market. If some bids and offers are ‘missing’ from the implicit allocation mechanism, then it could make sense to have explicit allocation in parallel. If the mechanism uses bids and offers from an exchange, allowing market participants to make direct or explicit offers for capacity could be useful, at least until the Regulators and TSOs gain confidence in the efficiency of the implicit allocation mechanism.

*Is it possible or desirable to allocate capacity between two markets implicitly if one of the markets is not liquid?*

It seems that allocating capacity between a liquid and a less liquid or illiquid market could result in some mis-pricing of capacity cross-border capacity at first. This is because the bids and offers in the illiquid market will not represent the true value of gas at any point in time. However, this is also true under any other allocation mechanisms, such as explicit auctions. But implicit allocation will at least help build up trading volumes in the less liquid market, so that the issue is resolved over time. We conclude that both markets do not need to be liquid to establish an implicit allocation mechanism.

*Are gas products sufficiently compatible across the EU to allow the implementation of implicit allocation?*

Gas products traded in the EU are highly standardised and do not represent a barrier to the implementation of an implicit allocation mechanism. We note that in the Netherlands gas products are defined with hourly delivery periods. This could raise issues for the implementation of within-day trading between the Netherlands and other countries. However, the presence of hourly products in the Netherlands would not affect the implicit allocation of day-ahead products.

### **1.3 CONCLUSIONS**

- An implicit allocation mechanism would solve co-ordination problems associated with cross border trading. This should lead to better price convergence which would have benefits in terms of improving price signals and resource allocation. However, the problems that implicit allocation will solve in gas markets are less severe than the problems that led to the introduction of implicit allocation in power markets.



- An argument for implicit allocation in gas markets amounts to saying that the TSO is better placed to bear the risk of holding cross-border capacity than traders. The TSO is ‘long’ capacity, and holds it until its value is realised. In a risk-neutral world, it would be equally possible for a trader to go long on capacity, and execute profitable cross-border trades as opportunities arise.
- We conclude that while many of these proposals put forward by the European Commission and ACER to improve the use and allocation of gas transport capacity will lead to more efficient use of capacity, they do not address the co-ordination issue we described above. Therefore they do not negate the need for implicit allocation.
- An obvious but fundamental step in the process of implementing an implicit allocation mechanism will be to make firm capacity available to be allocated. Where no spare firm cross-border capacity exists, regulators will need to work with TSOs and existing capacity holders to find an equitable way of making firm short-term capacity available. Capacity created by the new congestion management mechanisms, including changes to UIOLI rules and re-nomination limits, could be sufficient for the implicit allocation mechanism. This would avoid the need to negotiate the surrender of long-term capacity.
- Implicit allocation of cross-border capacity would represent a fundamental change from the traditional method of setting cross-border tariffs based on costs, to pricing capacity at its market value. However, this is also equally true of explicit capacity allocation mechanisms. Implicit and explicit auctions should yield similar short-term revenues on average.
- TSOs should continue to allocate the majority of cross-border capacity under long-term contracts which support infrastructure investment.
- There should be no reserve price for the implicit allocation mechanism.
- Implicit allocation should be used to allocate short-term, day-ahead or within day capacity. Initially the allocation of day-ahead capacity would be most logical, since liquidity is generally higher than for within-day products.
  - The allocation mechanisms should allocate capacity to the market parties whose trades will maximise welfare. The main challenge in implicit allocation is that the welfare maximising set of trades to which the mechanism should allocate capacity is not known until after the end of the gas day. We have developed a number of alternative implicit allocation mechanisms which attempt to control for this risk in different ways. However, it is not possible to say in advance which of the mechanisms would lead to higher welfare gains. Accordingly, we recommend that a trial is organized with at least the following mechanisms:

- Capacity allocated by the TSO during defined 'allocation windows' using bids and offers from the exchanges;
  - Combining order books of the exchanges on either side of the border during defined 'allocation windows' to allow traders to arbitrage price differences.
- To avoid regret costs, the development of implicit allocation mechanisms should be coordinated with the development of explicit auction mechanism. This will avoid the need to re-design IT systems that were designed for explicit allocation to accommodate implicit allocation.

## 2 PROBLEMS WITH GAS TRANSPORT IN EU GAS MARKETS

Effective third-party access to gas transport networks is an essential ingredient to a functioning and competitive EU gas market. Put simply, without access to gas networks on cost reflective and non-discriminatory terms suppliers cannot transport gas to their prospective customers, and there can be no effective competition in the gas market. Accordingly, many of the efforts regarding gas market liberalization have been focused on third party access to gas networks, and improvements in the management and allocation of gas transport capacity.

Despite, this, capacity allocation and the management of scarce capacity resources (congestion management) have continued to present challenges throughout the liberalization process. Almost ten years after the start of the liberalization process, the European Commission's 2007 sector inquiry identified a number of issues that reduced the effectiveness and level of completion in the EU's gas markets:

“For gas, available capacity on cross-border import pipelines is limited. New entrants are unable to secure transit capacity on key routes and entry capacity into new markets. Very often, the primary capacity on transit pipelines is controlled by incumbents based on pre-liberalisation legacy contracts which are not subjected to normal third party access rules. Incumbents have little incentive to expand capacity to serve the needs of new entrants. This is reinforced by ineffective congestion management mechanisms, which make it difficult to secure even small volumes of short-term, interruptible capacity on the secondary market. In many cases, new entrants have not even been able to obtain a sufficient amount of capacity when there have been expansions of transit pipeline capacity. Expansions have generally been tailored to the needs of the incumbents' own supply businesses.”<sup>4</sup>

The Commission also noted that:

“There is insufficient co-ordination between national energy networks, in terms of technical standards, balancing rules, gas quality, contact regimes, and congestion management mechanisms, which are necessary to permit cross-border trade to work effectively.”<sup>5</sup>

In an effort to resolve these issues, the third package implemented stronger unbundling requirements between TSOs and affiliated gas marketers, as well as new rules to operate networks and markets on the basis of common principles. The Commission was explicit that the objective was to facilitate cross-border trade and reduce transaction costs.<sup>6</sup>

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<sup>4</sup> DG Competition Report on Energy Sector Inquiry 10 January 2007 p.8.

<sup>5</sup> Commission Staff Working Document Accompanying the legislative package on the internal market for electricity and gas COM(2007) 528 final COM(2007) 529 final COM(2007) 530 final COM(2007) 531 final COM(2007) 532 final SEC(2007) 1180, Impact Assessment p.15.

<sup>6</sup> See European Commission, Slides presentation on the main novelties of the third package (no date).

While the third package has started the process of resolving the issues which the sector inquiry identified, problems still remain with respect to capacity allocation and cross-border trade. The Commission's most recent 'benchmarking report' published in June 2011 noted that:

"Even if interconnections exist, the absence of harmonisation of market rules in the different Member States leads to market segmentation and higher transaction costs which constitutes a barrier in particular for smaller player. This can even lead to the inefficient situation where gas and electricity flow from high-price areas to low-price areas."<sup>7</sup>

The majority of cross-border capacity is still allocated by either a first-come-first-served (FCFS) mechanism, or using a pro-rata allocation method. Neither of these mechanisms is efficient in the sense that they do not allocate capacity to the market parties that value it most. Nor do they reveal the market value of capacity thereby giving useful signals to guide investments.

The ability to obtain gas transport capacity is an essential ingredient for market entry. As we noted above, without capacity one cannot serve customers. Therefore the retention of capacity from the market has in the past proved an effective barrier to entry in the gas supply market, and enabled incumbents in some markets to maintain high market shares. The most recent benchmarking report noted that "[o]ut of the 21 countries who submitted data only United Kingdom has a concentration ratio for the 3 biggest wholesale companies less than 40%; a couple of countries have almost 70% (Spain, Germany) and the rest of the countries are very close to or above 90%."<sup>8</sup>

A recent report noted that incumbent firms with existing contracts already have claim over a significant portion of available supply, and the number of external producers is limited.<sup>9</sup> Another report noted that "[s]hippers who own excess long-term capacity may not want to sell on to the secondary market as they may want to use their capacity in the future and may be reluctant to allow new entrants into the market by providing them with capacity"<sup>10</sup> And another noted that the problem with access to capacity was due to "privileging access by incumbents' long-term contracts, and sometimes foreclos[es] access to markets."<sup>11</sup>

Though the physical capacity at cross-border connections may be sufficient to allow efficient trading across markets, available, non-booked, capacity is limited. A recent report for Ofgem on the Gas Target Model noted that "[c]ertain points on the European gas networks suffer from 'contractual congestion' that is where the network capacity is fully booked but not being used and is not made available (or only made available on less commercially attractive terms) for other parties to use."<sup>12</sup>

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<sup>7</sup> Brussels, 9 June 2011 Commission Staff Working Document 2009-2010 Report on progress in creating the internal gas and electricity market p.14.

<sup>8</sup> *Ibid.* p.9.

<sup>9</sup> "CIEP Vision on the Gas Target Model: ASCOS (Ample, Secure and Competitive Supply)" Clingendael International Energy Programme (CIEP). August 2011. p. 10

<sup>10</sup> "Market design for natural gas: the Target Model for the Internal Market A report for the Office of Gas and Electricity Markets." LECEG. Dr Boaz Moselle and Martin White. March 2011 p. 23 (4.16)

<sup>11</sup> "A vision for the EU target model: the MECO-S Model," Glachant, Jean-Michel. EUI Working Papers RSCAS 2011/38. June 2011. p.6

<sup>12</sup> LECEG *Op. cit.* p. 12 (2.5)

This hoarding of unused capacity creates the appearance of network congestion and reduces the ability of firms to trade when in fact additional capacity could be nominated for use. The Third Package for natural gas discussed this issue, noting that “physical congestion is ‘rarely’ a problem, but may become one in the future. However, there is ‘substantial’ contractual congestion.”<sup>13</sup> Use it or lose it (UIOLI) rules have attempted to address the problem, by trying to ensure that capacity that is not nominated is made available to others to use. But the existing UIOLI regimes have met with mixed success.

### 3 EXISTING PROPOSALS TO IMPROVE THE GAS MARKET

The third package’s objective of facilitating cross-border trade and reducing transaction costs are now starting to be translated into detailed procedures. During 2011 the European Commission has carried out a consultation on Congestion Management Procedures (CMP).<sup>14</sup> ACER has also drafted Framework Guidelines on Capacity Allocation Mechanisms (hereafter referred to as the FG CAM),<sup>15</sup> as well as Framework Guidelines for balancing.<sup>16</sup>

In a major departure from FCFS or pro rata capacity allocation mechanisms, the FG CAM requires that that “all firm and interruptible [cross-border] capacity services for each time interval, with the possible exception of within-day (intraday) capacity services, are allocated via auctions.”<sup>17</sup> The FG CAM goes on to note that this does not rule out that these auctions could be implicit, though the default assumption and the design described is for explicit auctions. Allocation by explicit auction would result in a move away from cost-based pricing for cross-border capacity, toward a market-based price for capacity. The market-value of capacity could either be more or less than the cost-based tariff.

Below we describe some of the main initiatives proposed to improve capacity allocation and congestion management, and address the problems described in the previous section. Any implicit allocation mechanism will take place against the background of these measures. Accordingly, it is important to have a clear understanding of the new measures so that the advantages and disadvantages of implicit allocation can be properly assessed.

#### 3.1 OVER-BOOKING AND BUY-BACK

- **Proposal:** Under this proposal, TSOs would offer for sale more cross-border capacity than can likely be made physically available. If nominations exceed the actual available capacity, then TSOs would ‘buy back’ capacity. As we understand it, this idea would be similar to the idea of re-despatch, in which the TSO asks for offers from producers upstream of a constraint to curtail their output, and for producers downstream of a

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<sup>13</sup> See Regulation (EC) No 715/2009, Recitals 21 & 22.

<sup>14</sup> See for example DG-TREN, Results of the CMP Public Consultation, 2nd CMP Workshop 16 May 2011, Brussels.

<sup>15</sup> ACER, Framework Guidelines on Capacity Allocation Mechanisms for the European Gas Transmission Network FG-2011-G-001 3 August 2011.

<sup>16</sup> ACER, Framework Guidelines on Gas Balancing in Transmission Systems FGB-2011-G-002 18 October 2011.

<sup>17</sup> FG CAM section 3.1.1 p.12.

constraint to increase it. Presumably under the Commission's proposals the TSOs would also solicit offers for users of cross-border capacity to curtail their flows until the total nominated flow matched the physical capacity available.

- **Likely effects:** The motivation for the proposal is similar to the philosophy of overbooking airline seats and then paying passengers not to board the flight if everyone shows up. Most of the time not everyone will want to nominate all of the capacity that they have bought, which allows for the TSO to offer more capacity for sale than is actually available. In our view the proposal would largely address deficiencies in the UIOLI system, and reduce contractual congestion.

### 3.2 RE-NOMINATION LIMITS AND FIRM UIOLI RIGHTS

- **Proposal:** The proposal is to limit the ability to re-nominate to a certain percentage of the original nomination, and to make some products sold under UIOLI rules firm. For example, if a shipper nominated a day-ahead cross-border flow of 100 MWh, it might only be able to increase or decrease its nomination by  $\pm 40$  MWh.<sup>18</sup> Presumably one of the motivations for this proposal is to limit the ability of shippers to 'withhold' capacity by nominating 100% of their contracted capacity, but then re-nominating close to zero a few hours before the flow hour.
- **Likely effects:** Again, this proposal seems largely designed to deal with contractual congestion, and ensuring that all available capacity is used. It seems likely that the proposal will increase the use of cross-border capacity by making UIOLI rules more effective.

### 3.3 BUNDLING CROSS-BORDER CAPACITY

- **Proposal:** Initiatives like the 'Link4hubs' scheme are already bundling cross-border capacity. Under the FG CAM, rather than sell cross-border capacity at individual entry and exit points, TSOs will combine or 'bundle' capacity at all the border points into a single product. Shippers simply buy capacity from country A to country B, rather than buy capacity at a specific border point. The scheme is also referred to as a hub to hub service. Under the Link4hubs scheme, the capacity is sold under a first-come-first-served (FCFS) basis at a regulated tariff, but in future the capacity will have to be auctioned to comply with the FG CAM.
- **Likely effects:** Bundling or hub to hub services are likely to make more efficient use of cross-border capacity. The service will for example prevent one border crossing point becoming congested while there is unsold capacity at another. The service also simplifies the process of cross-border trading, since the shipper only needs to enter into one transaction and make a single nomination. The TSO then makes a matching nomination on behalf of the shipper on the other side of the border.

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<sup>18</sup> These numbers are purely illustrative and do not draw on any official source.

### 3.4 LONG-TERM UIOLI

- **Proposal:** Shippers that systematically underuse capacity over a relatively long-period of time, for example a year, may be forced to sell the unused capacity.
- **Likely effects:** A longer term firm capacity product would presumably be a much more attractive product than a short-term UIOLI product. Shippers could more easily accommodate supply deals with the new long-term capacity and/or integrate the capacity into their existing portfolio.

### 3.5 CONCLUSIONS ON THE ‘NEW GAS MARKET’

The Commission’s sector inquiry and subsequent reports noted a number of shortfalls related to cross-border capacity allocation and congestion management. These mainly concerned capacity hoarding and the creation of contractual congestion, whereby incumbents could withhold unused capacity from the market so as to create a barrier to entry, thereby preserving large shares of the gas wholesale and retail markets.

The initiatives listed above should help to address contractual congestion, by creating more ‘usable’ cross-border capacity. The over-booking and buy back initiative, as well as stronger UIOLI rules will increase the cross-border capacity that is available to new entrants. The new rules should also ensure that any new capacity is allocated efficiently by means of an explicit auction. The bundling of different physical entry and exit points which serve the same markets will also allow more efficient capacity allocation. The market-pricing of capacity could also lead to better investment signals for capacity expansion relative to cost-based tariffs.

However, even if new capacity is available to entrants and it is allocated efficiently, issues still remain regarding the transactions costs and ease with which cross-border capacity can be *used*. The initiatives address the goal of easing market entry and enhancing competition. But a further goal is to make trading between regional markets as easy as possible.

One of the remaining issues we see is the co-ordination of the trading of the gas commodity and transport capacity. With an explicit auction mechanism to allocate capacity, to perform a cross border trade shippers must either:

- a) Be ‘short’ on cross border capacity, for example buying gas on one side of the border and selling on the other side before it has obtained cross border capacity or;
- b) Go ‘long’ on capacity, by obtaining cross-border capacity before the trader has carried out any trades that will use the capacity.

In case a) the trader might see a potentially advantageous cross-border trade, but be unsure whether to commit to the trade because he/she has not yet secured cross border capacity. This can also be seen as an informational or transactions costs problem – there may be third parties that have capacity for sale at a price that would make the trade worthwhile, but they are unaware that someone is looking for cross-border capacity or what price they would be willing to pay. These co-ordination issues could have a chilling effect on market liquidity, because traders do not undertake trades that it

would be advantageous to do. Traders might not project their bids and offers into neighboring markets in an efficient way. For example suppose that a trader was willing to sell gas in country A for €20/MWh. If the trader knew that capacity to country B was available for €1/MWh, it could equally make an offer to sell in country B for €21/MWh.<sup>19</sup> The presence of the offer in country B would increase liquidity there.

In case b), risk-averse traders might discount what they are prepared to pay for cross-border capacity in advance of identifying any trades. Alternatively, the trader may accidentally pay more for the capacity than it turns out to be worth based on differences in the cross-border value of gas. Either outcome does not give an accurate reflection of the true value of cross-border capacity. This could lead to distorted signals for cross-border investment. In its final Gas Target Model (GTM) paper, the CEER acknowledges the issue we describe above noting that while “[e]xplicit auctions are more efficient than current first-come-first-served arrangements [they] require shippers to coordinate buying network capacity with gas in order to trade across borders, which may be challenging in short timescales.”<sup>20</sup>

We discuss the role that implicit allocation could play in solving this issue in the following section.

## **4 THE ROLE OF IMPLICIT ALLOCATION**

### **4.1 THE PRINCIPLE OF IMPLICIT ALLOCATION IN GAS MARKETS**

An implicit allocation mechanism will allocate cross-border capacity on the basis of the bids and offers to buy and sell gas on either side of the border. That is, the TSO or Market Operator (MO) would see a bid to buy gas on one side of the border, and a bid to sell gas on the other side. The MO would then allocate cross-border capacity which would enable the maximum increase in welfare. More specifically this involves allowing the buyers with the highest willingness to trade with the sellers that will accept the lowest price.

Because it is important to have a clear understanding of the concept of implicit allocation of capacity in gas markets before continuing, we provide a simplified example which illustrates the main points. We start with Table 1, which illustrates the bids to buy and offers to sell made by market participants in the two neighbouring countries. Note that the bids and offers here could be viewed as the results of a ‘batch’ or discreet auction, or as a set of bids and offers made during continuous trading. We discuss the differences later in this report.

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<sup>19</sup> Throughout this report we use price differences to illustrate the examples which greatly exceed anything we would expect to see in reality. This is purely to make the examples easier to follow – we are aware that actual cross-border price differences would be much smaller than in our examples.

<sup>20</sup> CEER’s GTM paper, p.10.



**Table 1: Starting bids and offers in each country**

Country A				Country B			
Buy	Volume	Sell	Volume	Buy	Volume	Sell	Volume
21.55	500	20.95	600	21.65	600	21.05	200
22.35	300	21.25	700	22.45	300	21.35	600
21.05	100	21.15	300	21.15	500	21.25	400
21.45	600	21.1	600	21.55	800	21.2	700
22.1	800	20.85	400	22.2	200	20.95	300

In Table 2 the MO takes the bids put them in a single list while noting which country the bids were made in. The MO perform the same operation for the offers to sell.

**Table 2: Bids and offers combined**

Country	Buy	Volume	Country	Sell	Volume
A	21.55	500	A	20.95	600
A	22.35	300	A	21.25	700
A	21.05	100	A	21.15	300
A	21.45	600	A	21.1	600
A	22.1	800	A	20.85	400
B	21.65	600	B	21.05	200
B	22.45	300	B	21.35	600
B	21.15	500	B	21.25	400
B	21.55	800	B	21.2	700
B	22.2	200	B	20.95	300

In the final step, the MO sorts the bids to buy from highest to lowest, and the offers to sell from lowest to highest, as in Table 3. The difference between the selling price and the buying price is the gain from trade, which is the welfare benefit which arises from the transaction. Sorting the bids and offers in this way puts the trades with the largest gains at the top of the table. The MO can then allocate cross-border capacity to the trades which realise the greatest welfare increase, until either there are no more welfare improving trades to make or the interconnector capacity is fully used and congested. The welfare gain of the marginal or last trade allowed across the interconnector sets the value of cross-border capacity at that point in time.

The stylised example assumes a discrete number of bids and offers have been made available to the TSOs, but in reality the process described could be carried out on a continuous basis as new bids and offers are made in the market.<sup>21</sup>

Note that under the scheme described above, if capacity was allocated day-head by implicit allocation, and the price differences later reverse so that it would be more efficient to change the flow

<sup>21</sup> In mid-2011 GRT Gaz and Powernext introduced an implicit allocation mechanism between PEG Nord and PEG Sud in France which is broadly similar to the scheme described above.

direction, then it would still be possible for the TSO (or market agent) to trade out of the position, and free up the capacity. So for example suppose day-ahead the MO allocates capacity by buying gas in country A at a price of 20 and selling in country B for 22. Toward the end of D-1 the direction of the price difference reverses, so the price in country B is 18 and the price in country A is 21. The MO could then cancel the flow by selling the gas it has bought in country A at a price of 21, and fulfilling its obligation to deliver gas in country B by buying as at a price of 18. The MO could then schedule a flow in the opposite direction, from country B to country A.

**Table 3: Bids and offers sorted and allocation of cross-border capacity**

Country	Buy	Volume	Country	Sell	Volume	Gain from Trade	Cross-border flow
B	22.45	300	A	20.85	400	1.6	300
A	22.35	300	A	20.95	600	1.4	0
B	22.2	200	B	20.95	300	1.25	0
A	22.1	800	B	21.05	200	1.05	200
B	21.65	600	A	21.1	600	0.55	600
A	21.55	500	A	21.15	300	0.4	0
B	21.55	800	B	21.2	700	0.35	0
A	21.45	600	A	21.25	700	0.2	0
B	21.15	500	B	21.25	400	-0.1	0
A	21.05	100	B	21.35	600	-0.3	0

## 4.2 BENEFITS OF IMPLICIT ALLOCATION

The key feature of implicit allocation is that gas trades take place and capacity is assigned simultaneously. This solves the co-ordination problem section 3.5 describes. The implicit allocation mechanism should enact all welfare enhancing cross-border trades so far as capacity is available. In contrast, under an explicit auction mechanism the co-ordination problem remains, because the trading of capacity and the commodity does not take place at the same time.

As the CEER recently pointed out:

“The main benefits of an implicit capacity allocation are that it optimises flows and capacity usage on cross-border connections and increases liquidity in gas trading. By matching capacity against the trades with the greatest value, the platform ensures that the gas flows to where it is valued most whilst taking into account network constraints. Essentially, it allows for the cross-border trades between the two markets to be optimised, such that there is greater price convergence when there is sufficient physical interconnection capacity between the two markets but for prices to diverge when the interconnection is insufficient. It is a „dynamic“ approach, integrating gas markets and ensuring the efficient use of available capacity.”<sup>22</sup>

<sup>22</sup> Draft Vision for a European Gas Target Model A CEER Public Consultation Paper Ref: C11-GWG-77-03 5 July 2011, p.17.

Under an implicit allocation scheme, there would be no need to sell the capacity in advance. An implicit mechanism could allocate cross-border capacity at the same time as bids and offers were accepted. The difference between the buying price on one side of the border and the selling price on the other would give the implicit value of cross border capacity at that time.

Under an explicit auction the TSO tries to sell the capacity to shippers in advance of its use. But under an implicit allocation mechanism, the TSO is ‘long’ capacity, and holds it until it is used for a trade. It would be equally possible for a trader to go long on capacity, and execute profitable cross-border trades as opportunities arise. In effect, an argument for implicit allocation in gas markets amounts to saying that the TSO is better placed to bear the risk of holding cross-border capacity. It is important to stress that implicit allocation really amounts to shifting the risk of holding the cross-border capacity from traders to the TSO.

### **Increasing liquidity and lowering entry barriers**

As mentioned above, implicit allocation could make cross-border trading easier relative to a situation where TSOs hold explicit auctions for cross-border capacity. In effect, the implicit allocation mechanism creates an additional counter-party that is willing to trade cross-border, and bids and offers are matched and cleared that would not have been absent implicit allocation. This could help develop liquidity in European gas markets, and in particular enable liquidity to spread more easily from one trading zone to another. For example, GRTgaz have found that their implicit allocation experiment had increased the volume of trading in the PEG Sud zone. The system automatically generates offers for PEG Sud based on the more liquid PEG Nord zone and the price of inter-zone transportation.

Increased liquidity has a number of benefits. In a more liquid market gas prices reflect actual supply and demand conditions. More accurate prices should lead to more efficient decisions regarding resource use, in particular electricity generation where there is often a choice as to whether to generate from gas or another fuel. Absent a liquid market, the price of gas might not – and probably will not – reflect its actual value at any point in time.

The Commission’s sector inquiry noted that “developing liquid gas hubs is vital to allow new business models to develop in gas markets and to ensure that new entrants can secure access to gas at wholesale level.”<sup>23</sup> A more liquid gas hub could promote competition in the retail market. Without a liquid hub gas marketers would need to source all of their gas via a bilateral agreement with a supplier. As the Commission’s sector inquiry noted, this can be more difficult since incumbents can seek to ‘foreclose’ the market by refusing to sell gas to entrants, or offering the gas only at a price that would not allow an entrant to market the gas at a profit. The Commission also noted that “[f]or competition to develop, new entrants and existing competitors seeking to increase their market share must have the possibility to purchase the gas they require”.<sup>24</sup> The Sector inquiry found that the ability to obtain gas to sell was a barrier to entry in the gas retail market, and we can also infer from the text above that more liquid gas markets would help overcome this problem.

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<sup>23</sup> DG Competition Report on Energy Sector Inquiry 10 January 2007 ¶67 p.33.

<sup>24</sup> *Ibid.* ¶118 p.47.

Even absent problems of foreclosure, there are other practical reasons why a liquid gas market can help market entry and future competition. It can be difficult for a new entrant to sign a long-term supply contract – which may include ‘take-or-pay’ terms – before it has built up a customer base. But acquiring customers will be difficult without a long-term contract. A liquid hub would solve this “chicken and egg” problem, enabling new entrants to manage the transition as they build their portfolio by partly supplying customers with gas bought from the spot market.

Implicit allocation also makes some cross-border capacity potentially available to all market participants, via the exchange or capacity allocation platform. While traders cannot access cross-border capacity directly with implicit allocation, the increased market liquidity should facilitate them to trade cross-border by selling in one market and buying in another.

### **Quantifying the benefits of implicit allocations for the Dutch Borders**

To estimate the possible benefits of an implicit allocation mechanism, we have looked at how often price differences occur between the Netherlands, Germany and Belgium when there is no congestion on the pipelines. Price differences which occur absent congestion indicate the potential for efficiency improvements from an implicit allocation mechanism. Interconnectors might not be used efficiently because of the co-ordination problems we highlighted above, which explicit auctions would not solve. We would expect implicit allocation to result in the most efficient use of interconnector capacity, because with implicit allocation price arbitrage happens automatically.

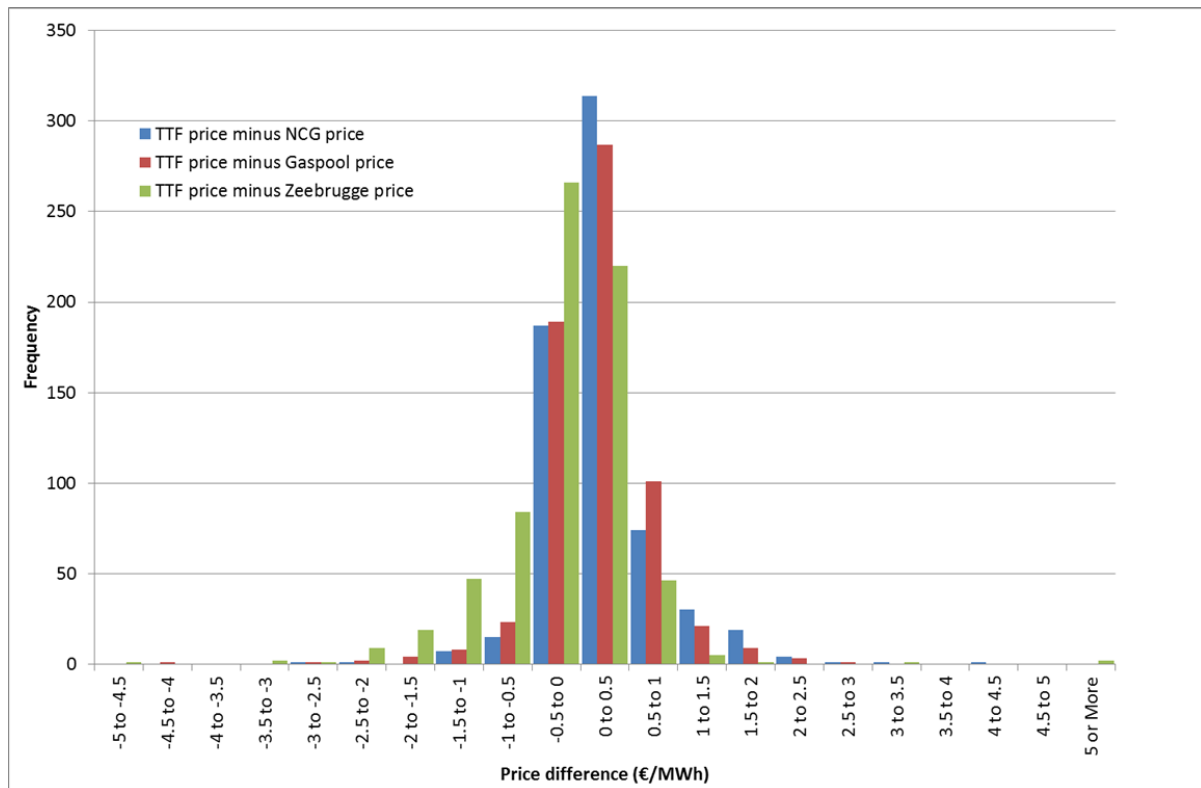
If cross-border interconnectors are being used efficiently then either:

1. The interconnector will not be congested, and prices on either side of the border will be equal. This is because if traders see any price differences, for example a higher price in country A than in country B, they will transport gas from B to A until the prices have equilibrated.
2. Alternatively, the interconnector will be congested, and prices in the two countries will diverge.

The extent to which this is not happening, and price differences occur even though there is spare interconnector capacity, is a measure of inefficiency of cross-border capacity use.

We have looked at daily price data from January 2009 to September 2011. We took day-ahead prices, because these are more readily available for all markets, implying that day-ahead markets are relatively liquid. Figure 1 illustrates the actual price differences between the TTF and the neighbouring pricing points. The first point to note is that there is actually a remarkable degree of price convergence already between the hubs. Price differences between the TTF and other hubs are less than €0.5/MWh, or within about 1-2% of one another, for about 70-75% of the time. Price differences only exceeded €1/MWh for about 10% of the time. Therefore there already seems to be a high degree of price convergence.

**Figure 1: Histogram of price differences between TTF and NCG, Gaspool and Zeebrugge for the period 2 January 2009 to 14 September 2011**



Perhaps surprisingly, the data indicates that the cross-border capacity is never fully utilised. That is, nominations were always less than the advertised capacity available. This meant that, while price differences were generally small, there were always further opportunities to arbitrage and converge prices.

We also looked at the flow nominations made day-ahead, and compared this to the available physical capacity available on the pipeline. We identified ‘inefficient’ hours as hours where there was a price difference but there was spare capacity in the pipeline. For these inefficient hours, we then calculated what gas prices would have been in the connected countries, if there was efficient arbitrage.

We have made an estimate of some of the direct welfare benefits from implicit allocation of capacity on the Dutch borders. The welfare benefits are the additional gains from trade that could occur with implicit allocation. For example, if in a given hour there is a party willing to sell 10 GWh of gas for €20/MWh in country A, and a party in country B is willing to buy this gas for €22/MWh then the gain from trade is  $(22 - 20) \times 10 \times 1000 = €20,000$ . If implicit allocation allows this trade to happen where it would not otherwise have done, then the benefit is €20,000. Appendix I gives more detail of the methodology behind our calculations.

Table 4 summarises the results. Our analysis indicates that the estimated welfare benefits per year on both borders vary in the range of €15-25 million per year.

**Table 4: Estimated Welfare benefits from implicit allocation of cross-border capacity**

Associated interconnector:	NL-BE	NL-DE (NCG)
2009	3.6	20.0
2010	4.0	10.7
2011*	6.7	6.2

Notes and sources:

\* only includes days until 14/09/2011

It is important to stress that these estimates are an upper bound of the possible welfare benefits for two main reasons. First, Congestion Management Procedures (CMP) and Capacity Allocation Measures (CAM) should improve the efficiency of cross-border capacity use. Second, we assume that there is always sufficient spare capacity for cross-border prices to converge. This may not always be the case, in which case not all of the benefits we estimate will materialise. For the purposes of cost-benefit analysis, it would be more prudent to take 50% of the estimated maximum benefits. This indicates that the benefits would be in the range of €8-13 million per year for the Dutch borders.

#### **Benefits for other countries in NWE**

The level of inefficiency that occurs from explicit auctions relative to implicit allocation will be linked to the level of imports and exports. On borders between countries with similar price levels, flows should often occur in either direction. Therefore it may be more difficult to predict the value of capacity in either direction on the border. In contrast, if price differences are more predictable and the direction of flow is fairly constant, it will be easier to predict the value of cross-border capacity. In this situation we would expect the gains from introducing implicit allocation to be less than a case where flows change direction more frequently.

To get a sense of how gas flows vary in NWE, we have looked at the trade flows of gas for 2010, which Table 2 illustrates. Flows from the Netherlands to Belgium, and then Belgium to France are all in one direction. This indicates that there is less value in applying an implicit allocation mechanism on these borders relative to an explicit auction, because flows are more predictable. In contrast, while flows are predominately from the Netherlands to Germany, there are also flows in the other direction. This indicates that there could be higher benefits to implicit allocation on the Dutch-German border. This fits with our welfare analysis, which shows that the welfare benefits on the Dutch-Belgium border are less than on the Dutch-German border. The trade flows indicate that the greatest benefits for implicit allocation would occur on the pipelines between Germany and Austria, Germany and Belgium and Germany and the Netherlands.

**Table 5: Gas trade flows in NWE**

From	To		Estimate of flows between countries( bcm)		Ratio of reverse to forward flow
			Forward	Reverse	
Netherlands	Belgium	[1]	12.40	0.00	0%
Belgium	France	[2]	16.70	0.00	0%
Germany	France	[3]	3.98	0.00	0%
UK	Belgium	[4]	8.90	1.26	14%
Netherlands	UK	[5]	8.07	1.46	18%
Netherlands	Germany	[6]	32.86	6.64	20%
Austria	Germany	[7]	6.42	1.52	24%
Germany	Belgium	[8]	8.86	3.35	38%

### 4.3 COSTS OF IMPLICIT ALLOCATION

The costs of an implicit allocation mechanism will of course depend on the precise way the mechanism is implemented. We discuss these issues in more detail in sections 6 and section 7. However, broadly speaking the main costs of an implicit allocation mechanisms would be the development of a software platform to implement the mechanism, and perhaps also the development of new functions for the TSO depending on its involvement.

## 5 RELEVANT GAS MARKET CHARACTERISTICS

Having examined the costs and benefits of implicit allocation, in this section we describe the main characteristics that will inform the design of an implicit allocation mechanism. These are:

- Continuous trading – gas trading is usually continuous and balancing periods are more flexible than in power markets. Typically traders only need to balance their inputs and outputs of gas over a 24 hour period.
- Cross-border flows – large volumes of gas are traded across borders, and some Member States import all of nearly all of their gas;
- Security of Supply – as a consequence of the point above, import infrastructure is often critical for security of gas supply if there are few sources of domestic gas production;
- Long-term investments – investments in the gas industry tend to be long-term and irreversible.
- OTC trading – most gas volumes in the EU are traded ‘Over The Counter’ (OTC) rather than on an exchange;
- Products traded – there is a relatively high degree of harmonization in the products traded, either OTC or on exchange.

We expand on these issues below.

## 5.1 CONTINUOUS TRADING AND MORE FLEXIBLE BALANCING PERIODS

Trading in gas markets tends to be continuous, rather than as a series of discrete auctions as in electricity markets. That is, traders will ‘post’ a bid to buy or an offer to sell, and wait an undefined period of time before the bid or offer is accepted. In contrast, prices in electricity markets will be formed according to a very precise timetable. This difference is probably because supply and demand in electricity systems must be very finely balanced at every point in time, whereas in gas markets some mismatches between supply and demand can be managed by storing gas in the pipeline’s so-called linepack. The system operators in power markets therefore need relatively precise advance notice of the hourly generation and cross-border flows. In gas markets, the SO can manage the system as long as supply and demand balance more-or-less over the day, and planning can be more flexible.

In gas markets, buyers and sellers conclude discrete deals for a volume of gas at a price that is specific to that trade (a ‘deal-specific’ price). Day-ahead electricity markets tend to have a single clearing price for each hour or half hour. Therefore in gas markets there is no single price for each hour, but rather a distribution of prices each corresponding to a different deal made during the gas day. Gas exchanges do publish average daily prices, but these are not the price at which any particular trade settled. In contrast, a price published for a given hour for a power exchange is the price at which all the trades for that hour settled.

The delivery period in most gas markets are over the day, rather than the hourly or half-hourly delivery periods found in electricity markets. Again, this is because mismatches between supply and demand within the day can usually be managed by the SO.<sup>25</sup>

One of the responses to the CEER’s GTM consultation summarised some of these differences as follows:<sup>26</sup>

[In] Electricity [markets] short term trading is fundamentally based on a day ahead fixing mechanism. This fixing reflects both the generation merit order and the demand forecast for the next day. Because electricity cannot be stored the match between programmed generation and demand has to be perfect. To reflect this, both explicit and implicit (market coupling) transmission capacity auctions were developed on a day ahead basis through a fixing mechanism for the electricity markets. Because gas is a much more flexible commodity there is no need for such rigorous day ahead planning as in electricity, gas is traded in a continuous manner (not through fixing mechanisms). If the concept of market coupling is to be adapted to gas, it should be consistent with the fundamentals of trading of this commodity.

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<sup>25</sup> Note that in the Netherlands the balance position of each shipper is measured for every hour of the gas day, and so within-day trades must be assigned to a specific hour or group of hours.

<sup>26</sup> GRTgaz’s answer to CEER’s call for Evidence concerning the Gas Target Model, January 2011.



## Trading flexibility

One of the implications of continuous trading is that in gas markets the flow associated with a short-term trade will always go from the low price area to the high price area.<sup>27</sup> In contrast, prior to the introduction of implicit allocation in power markets, in a given hour flows were programmed from the high price area to the low price area. The continuous nature of gas trading means that this situation would not arise in gas markets. Traders can see what the price of potential trades will be before making a commitment to a trade and a flow. Accordingly, there is not the same possibility for trades to go in the ‘wrong’ direction on a day-ahead basis – so from the high prices to the low price area – in gas as there is in electricity.

For example, suppose a trader bought gas in the Netherlands for €20/MWh and sold it for €21/MWh in Belgium at 09:00 on D-1. Suppose that at 18:00 D-1 the price direction has reversed and the price in Belgium is €20/MWh and the Dutch price is €22/MWh. The trader can cancel the cross-border flow by buying gas in Belgium for €20/MWh and still selling this at the earlier price of €21/MWh. The trader can then sell the gas it bought for €20/MWh for €22/MWh in the Netherlands. If the trader holds capacity in the other direction, it could then plan a reverse flow by buying more gas in Belgium at €20/MWh and selling it in the Netherlands for €22/MWh.<sup>28</sup>

In gas markets, if it became attractive later in the day to send gas in the opposite direction, traders can trade out of their previous commitments and reverse the flow because the trade is continuous, and they are able to re-nominate their gas flows. Therefore gas markets do not share one of the problems that led to the introduction of implicit allocation in power markets.

In contrast, in power markets, implicit allocation of day-ahead capacity was introduced partly because market parties had to commit to import or export power from one country to another before they knew what the relevant prices were.

To see the issue in power markets, suppose that a Belgian generator thought that Dutch prices in a particular hour would be higher than Belgian prices, so that they offered to sell power on the Dutch APX market. On D-1 at say 09:00 the Belgian generator would buy day-ahead capacity for the direction Belgium to the Netherlands. The results of the auction would be announced late morning, in this example 11:00. At D-1 12:00 the Belgian generator would then offer power into the Dutch market. Of course the day-ahead prices in the Netherlands and Belgium are not known at the time the offer is made, since gate closure for the APX market is a few hours before the prices are published. More fundamentally, the offer from the Belgian generator and others determines the day-ahead prices, and so the prices cannot be known until all the bids and offers have been made. The Belgian generator would then be informed if its offer was accepted and the resulting outturn prices at say 17:00 on D-1.<sup>29</sup>

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<sup>27</sup> Note however that we do see gas flows that are associated with long-term gas contracts going from high price areas to low price areas (based on day-ahead prices). The reasons for this are not fully clear, but it is likely that the volumes involved are too large to reverse the flow in the way described in the example above.

<sup>28</sup> However, we note that the initiatives described in section 3.2 could restrict the ability to re-nominate gas flows.

<sup>29</sup> The timings in this example are approximate, and may not conform exactly to the times that were used before the introduction of market coupling. The sequence of events is nevertheless correct.

But if the outturn Dutch price was €50/MWh and the Belgian price was in fact €60/MWh, then the Belgian generator has sold power in the wrong market – it would have been better to sell power in Belgium. While the generator would of course make a profit, since the price is above its marginal cost, it has not made as much profit as it would have done if it sold the power in Belgium. However, the generator is now obliged to deliver the power in the Netherlands. Since the day-ahead market has closed, and the intra-day market is relatively thin, the Belgian generator has few options but to nominate a flow from Belgium to the Netherlands to honour its delivery obligation.<sup>30</sup> This results in trade going the ‘wrong way’ from the high price area (in this example Belgium) to the low price area (the Netherlands).

Prior to the introduction of implicit auctions, it was relatively common to see net flows in the wrong direction, especially between countries where the direction of the price differences changed frequently and were therefore hard to predict. Implicit allocation solved this problem – by deciding flows and prices simultaneously, it was no longer possible to schedule flows in the wrong direction. As a result, the introduction of implicit allocation in power markets results in large welfare gains by ensuring that flows always went from the low price region to the high price region.

As we describe in section 4, there are potential benefits from the introduction of implicit allocation of cross-border capacity. But because of the ability to trade continuously and more flexible cross-border re-nomination rules, the problems that implicit allocation will solve in gas markets are less severe than the problems that led to the introduction of implicit allocation in power markets.

## 5.2 CROSS BORDER FLOWS

Cross-border flows in gas are generally much higher than in electricity as a proportion of domestic demand. This is because the number of physical production points for gas is limited by geography – many Member States produce little or no gas and therefore have to import most or all of their gas needs across one or more borders. Gas Infrastructure Europe estimates that 60% of gas consumed is traded across at least one EU border.<sup>31</sup> In contrast, power can be generated in every Member State by building a power station. As a result most power used is generated within the country rather than imported. This also means that revenues from cross-border flows may be more important for gas TSOs than for electricity TSOs.

The availability of cross-border capacity is easier to forecast in gas than in electricity. Physical flows in electricity markets do not follow the contractual path, but rather follow the laws of physics, flowing along the path which offers the least resistance. For example if a generator in Belgium sells power to a customer in the Netherlands, much of the power may actually travel via France and Germany. Physical flows which deviate from the contractual path are known as ‘loop flows’. Therefore in power every change in generation and demand affects flows across the entire grid,

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<sup>30</sup> Even if the intra-day market was liquid the Belgian generator would still have lost money on the trade by ‘buying’ (or giving up) at high price and selling at a low price. This could not happen in gas markets for the reasons given above. However, if the intra-day markets were more liquid the Belgian generator might opt to buy power on the Dutch intra-day market to make good on its obligation to deliver power in the Netherlands, instead of scheduling a cross-border flow from Belgium.

<sup>31</sup> [www.gie.eu.com/index.php/maps-data](http://www.gie.eu.com/index.php/maps-data)

including cross-border flows. This makes it difficult for power SOs to estimate how much cross-border capacity will be available at any time.<sup>32</sup> Gas flows are also influenced by changes in demand and supply, but the gas flow can be directed by simple pressure differences. There is no equivalent of the ‘loop flow’ phenomena which occur in AC power networks.

Gas markets usually allow re-nominations of cross-border flows throughout the day, whereas in most electricity markets flows cannot be adjusted only be adjusted within-day. However, this situation is in flux, since we understand that Belgium and Germany allow so-called ex-post nominations where parties can re-nominate power flows up to 10:00 on D+1. This system will be introduced in the Netherlands at some point in Q1 2012. It only applies to domestic rather than cross-border trades, though cross-border functionality may be added at some point in the future.

### **5.3 SECURITY OF SUPPLY**

The point discussed above regarding cross-border flows also has implications for security of supply and the sizing of gas infrastructure. Some Member States have little or no indigenous gas production, and so are almost entirely dependent on gas imports. This means that import pipelines may be sized so that they are rarely or never congested, especially if gas storage within the country is impractical or expensive.

### **5.4 LONG TERM AND IRREVERSIBLE INVESTMENTS**

Investments in gas infrastructure tend to be large or ‘lumpy’ and irreversible. That is, once a pipeline is built from, for example, Belgium to the Netherlands, it cannot be redeployed on another route. This means that gas infrastructure is vulnerable to the ‘hold-up’ problem. For example, a shipper could ask a TSO to build a pipeline. But once the pipeline is built, the shipper could then refuse to pay more than the pipeline’s marginal cost. The TSO would have little choice but to accept this offer, since the costs of the pipeline are sunk and it can do nothing else with the asset. Recognising this issue, gas infrastructure projects are rarely built unless either the regulator ensures that the TSO will be allowed to recover the costs from customers in the TSO’s designated monopoly area (usually a country) or the project is underwritten by long-term contracts with customers.

### **5.5 OTC vs. EXCHANGE VOLUMES**

In European gas markets, most trading takes place on the Over the Counter (OTC) market, as opposed to on a cleared exchange. To illustrate this point, we have reviewed the volume of OTC gas trading vs. exchange-based trading for the three month period June 2011 to August 2011 inclusive. Table 6 shows the results. It is immediately clear that OTC volumes are much larger than exchange-traded volumes. However, since the implicit allocation method will likely be based on day-ahead trading (or perhaps within-day) the most relevant measure is the ratio of OTC day-ahead trading volumes to vs. day-ahead trading volumes on the exchange. This ratio might be different from the ratio of total OTC volumes to total exchange volumes. Unfortunately we could not find public data

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<sup>32</sup> Flow-based capacity allocation mechanisms in power markets should help make contractual and physical flows more consistent with one another.

which broke down OTC trades by the volume of each product traded – for example, day-ahead, month-ahead *etc.*

However, the NMa's market monitoring report for 2010 indicates that, for the Netherlands at least and for 2009, the proportion of different products traded by volume is similar in both the OTC market and on the exchange.<sup>33</sup> For example, the NMa data indicates that in 2009 day-ahead products were responsible for 5% of OTC volumes, whereas they were responsible for 3% of exchange volumes. Monthly, quarterly or seasonal products made up 65% of OTC trade volumes and 64% of exchange trade volumes. Therefore, in the Netherlands, the ratio of the total volume of trading on the OTC markets to the total volume on the exchange, which is about 600, is a good approximation of the ratio of day-ahead volumes on the exchange and on the OTC markets. Therefore it seems likely that day-ahead trading volume on the OTC market is about 500-600 times greater than on the exchange (see Table 6).

In Germany the ratio of OTC trading to exchange trading is between 50-200. This ratio is lower than the Netherlands but still indicates that OTC volumes are many times higher than the exchange volumes. The interesting exception is the French PEG market area. PEG has the highest exchange volumes in absolute terms, and has a ratio of OTC volumes to exchange volumes of between 5-10, an order of magnitude lower than the other market areas.

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<sup>33</sup> NMa, *Monitor groothandelsmarkten gas en elektriciteit 2010*, February 2011, Figure 33 p.40.

**Table 6: Ratio of OTC and Exchange volumes for gas trading<sup>34</sup>**

				Jun-11	Jul-11	Aug-11
				[A]	[B]	[C]
<b>TTF</b>						
OTC and exchange volumes (GWh)	[1]	LEBA		470,854	480,101	613,568
Exchange volumes (GWh)	[2]	APX & EEX		831	2,198	933
Ratio	[3]	[1]/[2]		566	218	658
<b>Gaspool</b>						
OTC and exchange volumes (GWh)	[4]	LEBA		23,522	25,050	18,961
Exchange volumes (GWh)	[5]	EEX		112	137	132
Ratio	[6]	[4]/[5]		211	182	144
<b>NCG</b>						
OTC and exchange volumes (GWh)	[7]	LEBA		50,177	75,572	87,240
Exchange volumes (GWh)	[8]	EEX		877	487	633
Ratio	[9]	[7]/[8]		57	155	138
<b>PEG</b>						
OTC and exchange volumes (GWh)	[10]	LEBA		35,811	20,597	20,636
Exchange volumes (GWh)	[11]	Powernext		4,123	2,814	4,183
Ratio	[12]	[10]/[11]		9	7	5

## 5.6 GAS PRODUCTS TRADED

Most gas in continental Europe is still bought and sold under long-term contracts – that is contracts that last for at least five years.<sup>35</sup> These contracts are usually highly tailored to the specific needs of the buyer and the seller. However, there is a growing volume of OTC trade via standardised contracts. These standard contracts largely apply the European Federation of Energy Trader’s (EFET’s) standard terms and conditions. Under these contracts, all of the main terms and conditions are standardised, and traders only need to fill in the volume and the price. They can also make some choices from a pre-set ‘menu’ as to the precise terms and conditions that will apply, for example with respect to collateral requirements. Most OTC trades are for shorter-term day-ahead or month-ahead products. OTC trading in longer term quarterly and annual products is relatively thin, even in the NBP market which has the most liquid day-ahead market in the EU.

The exception is the GB gas market, where a higher volume of gas is traded OTC relative to under long-term contracts. Even where there are long-term contracts in the GB market, the prices tend to be indexed to NBP prices.

<sup>34</sup> Note that LEBA only report data for the sum of OTC and exchange volumes.

<sup>35</sup> See for example the DG Competition Report on Energy Sector Inquiry 10 January 2007 Figure 72 p.238.

## 6 DESIGN ISSUES FOR IMPLICIT ALLOCATION MECHANISMS

Within the general description of implicit allocation in section 4.1, there remain a number of important design choices:

- Should the implicit allocation mechanism use an exchange infrastructure, that is where trades are cleared? Or should it use bids and offers on the Over The Counter (OTC) markets?
- Should the implicit allocation mechanism be continuous? Or should it use some kind of dedicated auction platform where the trades used to allocate capacity are made within a defined time period?
- What capacity products should be allocated by the implicit allocation mechanism? For example monthly, weekly or daily capacity?
- How should the revenues or rents from implicit allocation be allocated?
- Should implicit allocation be an exclusive allocation mechanism for a given product? Or could it and should it work alongside explicit allocation?
- Are gas products sufficiently compatible across the EU to allow the implementation of implicit allocation?

We discuss these issues below. We begin with a discussion of the pre-conditions we think are required for Implicit Allocation.

### 6.1 PRE-CONDITIONS FOR IMPLICIT ALLOCATION

#### **Available capacity**

An obvious but fundamental step in the process of implementing an implicit allocation mechanism will be to make firm capacity available to be allocated. The FG CAM acknowledges this requirement in principal, noting that “[a]t least 10 percent of the available firm capacity at each interconnection point shall be set aside for firm capacity services with duration of less than one quarter [of a year]”.<sup>36</sup>

Where no spare firm cross-border capacity exists to dedicate to the implicit allocation mechanism, regulators will need to work with TSOs and existing capacity holders to find an equitable way of making firm capacity available. One solution may be that the capacity created by new congestion management mechanisms, including ‘over-booking and buy-back’ and revised UIOLI arrangements, could be sufficient for the implicit allocation mechanism. This would avoid the need to negotiate the surrender of long-term capacity. Regulatory Authorities could also allow TSOs to assume responsibilities for capacity that has been surrendered to them and use it for the implicit allocation mechanism, rather than selling it back into the market.

#### **Bundling of cross-border capacity**

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<sup>36</sup> FG CAM section 2.3 p.9.

As we noted in section 3.3 of this report, section 2.4 of the FG CAM requires bundling of cross-border entry and exit capacity, or more formally that “[t]he corresponding exit and entry capacity available at both sides of every point connecting adjacent entry-exit systems shall be integrated in such a way that the transport of gas from one system to an adjacent system is provided on the basis of a single allocation procedure and a single nomination.”<sup>37</sup> The FG Cam refers to the integration of two or more physical border-crossing points as a ‘virtual interconnection point’.

An implicit allocation mechanism can only allocate capacity between two markets. It cannot distinguish between alternative pairs of physical entry and exit points between two markets. Therefore the creation of virtual interconnection points is a desirable feature for the implementation of implicit allocation, and should simplify the mechanism.

### **Product Compatibility**

For implicit allocation to work smoothly, gas products should be easily tradable across borders. For example, the terms and conditions of the contracts on either side of the border should be sufficiently harmonised that a day-ahead gas product in country A is in essence the same as a day-ahead gas product in country B. Otherwise, differences in terms and conditions would introduce additional risks to cross-border trading. Prominent examples are *force majeure* clauses. Suppose a trader bought gas from a counter party in country A and sold to another party in country B. Suppose that delivery was interrupted in country A due to a *force majeure* event, but the terms and conditions did not excuse the trader from delivery in country B, because the event which has occurred did not qualify as a *force majeure* event in country B. The trader would be obliged to deliver gas which it did not have. This is one example of differences in terms and conditions introducing risk.

As we note in section 5.6 all of the markets in NWE have similar and compatible gas commodity products, and in particular the gas-day is harmonised so that day-ahead products can be traded cross-border very easily. The exception is that the Netherlands has hourly gas products which could complicate within day trading arrangements. Hence implicit allocation of within-day products between the Netherlands and other countries could be problematic. For example, a Dutch within-day product that had a delivery period between 15:00 and 16:00 would have no equivalent in Germany. However, trading day-ahead and longer dated products should not be a problem. However, in general we conclude that gas product specifications are sufficiently harmonised already so that this issue would not be a barrier to the implementation of implicit allocation mechanisms in NWE.

### **Market Liquidity**

For the implicit allocation to be an efficient way of allocating cross border capacity, the bids and offers available to the TSO should be representative of the value of gas at any point in time. There should be frequent and numerous bids and offers made in the market on which the TSO can base capacity allocation decisions. In other words, for implicit allocation to be an efficient allocation mechanism we would like liquid gas markets.

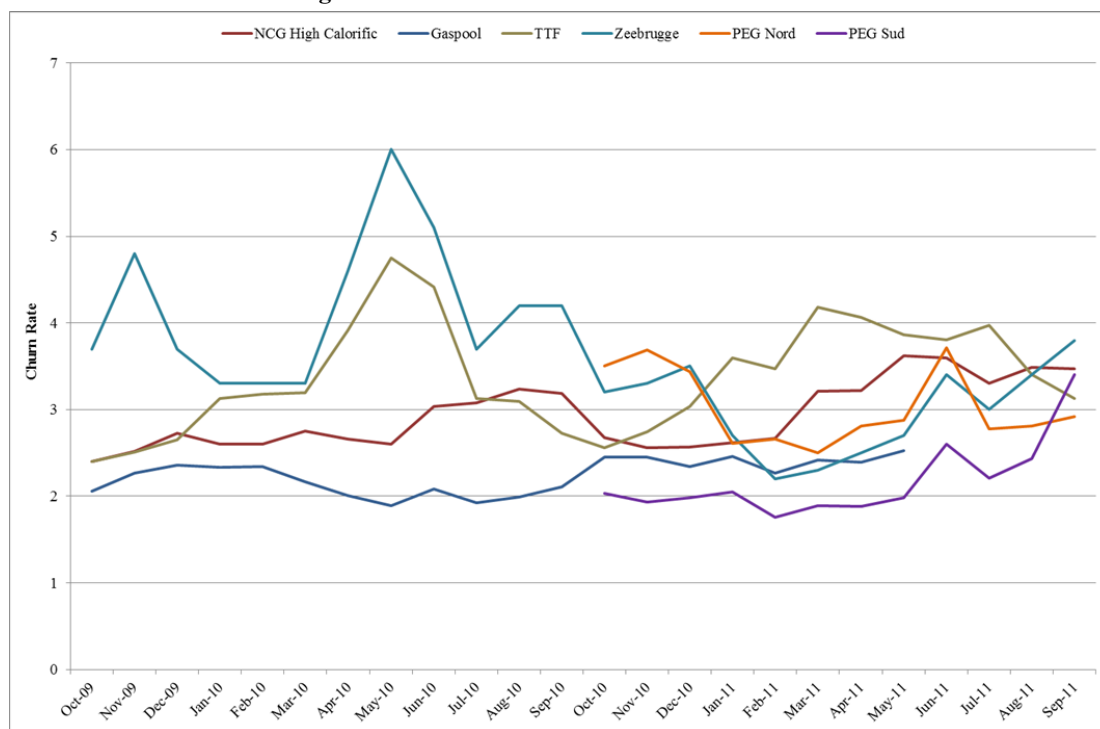
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<sup>37</sup> FG CAM section 2.4.1 p.9.

Liquidity has several definitions – for example churn,<sup>38</sup> bid-offer spreads and trading volumes are all measures of liquidity. In its GTM paper, the CEER suggested that to be a ‘functioning gas market’, the churn rate should be 8 or higher.<sup>39</sup>

Figure 2 illustrates the churn rates of the major market areas of NWE for the period October 2009 to September 2011. The chart shows that with the exception of PEG Sud, most of the hubs have churn rates within the range of 3-4, but none of the markets are close to the CEER’s suggested churn rate of 8. Churn rates of 3-4 are well below churn at the UK’s NBP, which is in the range 15-20. However, we also know that traders seem to regard prices at TTF and the German hubs as sufficiently reliable to act as price indices for contracts.<sup>40</sup> Therefore churn rates in NWE seem to be consistent with functionally liquid markets, even though they are less than the CEER’s suggested churn rate.

**Figure 2: Churn rates in the NEW market areas**



A related question is – do both sides of the market need to be liquid, in the sense described above? Would it be possible to successfully apply implicit allocation between a liquid market and a much less liquid market?

<sup>38</sup> Churn is the ratio of gas volumes traded for a particular period to the volume of gas volume delivered. In essence it measures the number of times each gas molecule is traded.

<sup>39</sup> CEER’s GTM paper pp.8-9.

<sup>40</sup> GasTerra has offered market parties a one year contract at prices index-linked to TTF Month Ahead or TTF Quarter Ahead prices. See GasTerra press release, ‘GasTerra offers new products on the TTF’ (Mar. 30, 2011). Trade journal articles have listed several instances where German gas suppliers have linked contract prices to the prices on the German hubs. See for example ‘Montana offers EEX-indexed supplies’ *Platts’ European Gas Daily* (Sept. 9, 2010), p.3.



On this point, the Italian market operator notes that:

“Experiences show that implicit auctions for the management of cross-border capacity can be successfully launched even in presence of illiquid local energy markets if at least one of the coupled market has an adequate level of liquidity. The [rationale] is that by coupling, via an implicit auction mechanism, two local energy markets, the liquidity of the immature market is going to increase since its participants may access to the liquidity of the more mature market.”<sup>41</sup>

GME go on to give the examples of the Nord Pool market which had established in Norway and Sweden, and in 1998 was successfully extended to the much less liquid Finnish market. In 2006, the Trilateral Market Coupling (TLC) between France, Belgium and Netherlands linked the relatively liquid Dutch power market to the much less liquid Belgian power market.

More recently, GRTgaz has linked the relatively liquid PEG Nord to the much less liquid PEG Sud. GRTgaz have explained that their market coupling system has increased the number of bids and offers made in the south, because the system automatically generates or ‘projects’ bids and offers in the north to the south by adding on the cost of the inter-zone capacity.

It seems that allocating capacity between a liquid and a less liquid or illiquid market could result in some mis-pricing of capacity cross-border capacity at first. This is because the bids and offers in the illiquid market will not represent the true value of gas at any point in time. However, this is also true under any other allocation mechanisms, such as explicit auctions. But implicit allocation will at least help build up trading volumes in the less liquid market, so that the issue is resolved over time. We conclude that both markets do not need to be liquid to establish an implicit allocation mechanism.

## **6.2 USE OF EXCHANGE OR OTC?**

Assuming that the implicit allocation mechanism used some form of continuous bids and offers, the mechanism would need to be designed to use either bids and offers from the OTC market, or from an exchange. The reason that a choice must be made is that the mechanics or process of trading on each of these platforms is different, and so the implicit allocation mechanism and the roles and responsibilities would be different depending on this choice.

For example, the ability to automate the implicit allocation process, and the role of the TSO would differ according to which set of bids and offers were used to allocate capacity implicitly. As we explained above, implicit allocation will involve a matching of trades so as to maximise the gains from trade or welfare. If the implicit allocation mechanism used exchange software, this process could be fully automated. Indeed, GRTgaz have explained that one of the reasons they chose to implement their implicit allocation mechanism on the Powernext platform was so that they could automate the process, and minimise GRTgaz’s direct intervention in the market. It would be more difficult to automate the implicit allocation process if it was carried out in the OTC market, since

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<sup>41</sup> Case study: implicit auctions lessons from the electricity experience Florence School of Regulation 24th March 2011 Fabrizio Carboni, *Gestore Mercato Elettrico*.

there is no unified IT architecture. In the OTC market bids and offers can come from multiple broker systems and indeed by telephone. Even supposing that the matching of trades could be automated, so that a software system automatically identifies the trades that should take place to maximise welfare, this is only the first step in the trading process. The TSO or MO would still have to settle the terms of the trades, organise payments, and deal with the consequences if the trade cannot be confirmed.

This leads to the next important difference – trades on the exchange are cleared. That is, the exchange acts as the counter party to both sides of a trade, and guarantees payment to the counterparty if the other counterparty defaults on delivery, perhaps due to bankruptcy. Moreover trades on the exchange are firm, meaning that once the trade is accepted it will be completed. In return for providing this service, the exchange demands that both sides put up collateral to support the deal. In the OTC market counterparties arrange their own collateral requirements for deals that are not cleared via an exchange.<sup>42</sup> If the TSO or its agent was acting as a trader, it would need to assume counterparty risk and provide collateral. This would have to be dealt with in the TSO's regulatory regime.

The other important issue is the liquidity of exchanges as compared to the liquidity of the OTC markets. In this context, the most important dimension of liquidity is the number of bids and offers available. This is because the more trades the TSO has to choose from in allocating cross-border capacity the closer the TSO will be able to get to maximising welfare. In section 5.5 we noted that in gas markets, most trading was done on the OTC markets rather than on the exchange. This indicates that an implicit allocation mechanism using OTC bids and offers could create greater welfare gains than using an exchange-based platform.

However, looking at only the volume of trade executed exaggerates the advantages of the OTC market from the perspective of an implicit allocation mechanism for two reasons. First, in practical terms the implicit allocation mechanism could only use bids and offers that were made via a screen-based system. But we understand that a significant proportion of OTC trading is done verbally based on telephone conversations, which would be impossible to include in an automated system. If the mechanism could only use the OTC bids and offers that were made on screen, this would reduce the volume of OTC bids and offers that are available to use for implicit allocation. Second, the TSO would need to pre-qualify a group of market participants that it was happy to trade with, in terms of credit risk. The TSO would likely also specify a specific form of OTC contract that was acceptable for implicit allocation.<sup>43</sup> These requirements would further narrow the set of bids and offers available for the implicit allocation mechanism.<sup>44</sup>

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<sup>42</sup> Although proposals by the European Commission, such as the European Market Infrastructure Regulation, will place tighter controls on collateral in the OTC market in the future.

<sup>43</sup> In continental Europe, we understand that most OTC trades use European Energy Traders Association (EFET) contract. While this is highly standardized, the contract contains a number of options which can be selected by the counter parties. Hence the TSO would need to agree a specific form of the standard EFET contract.

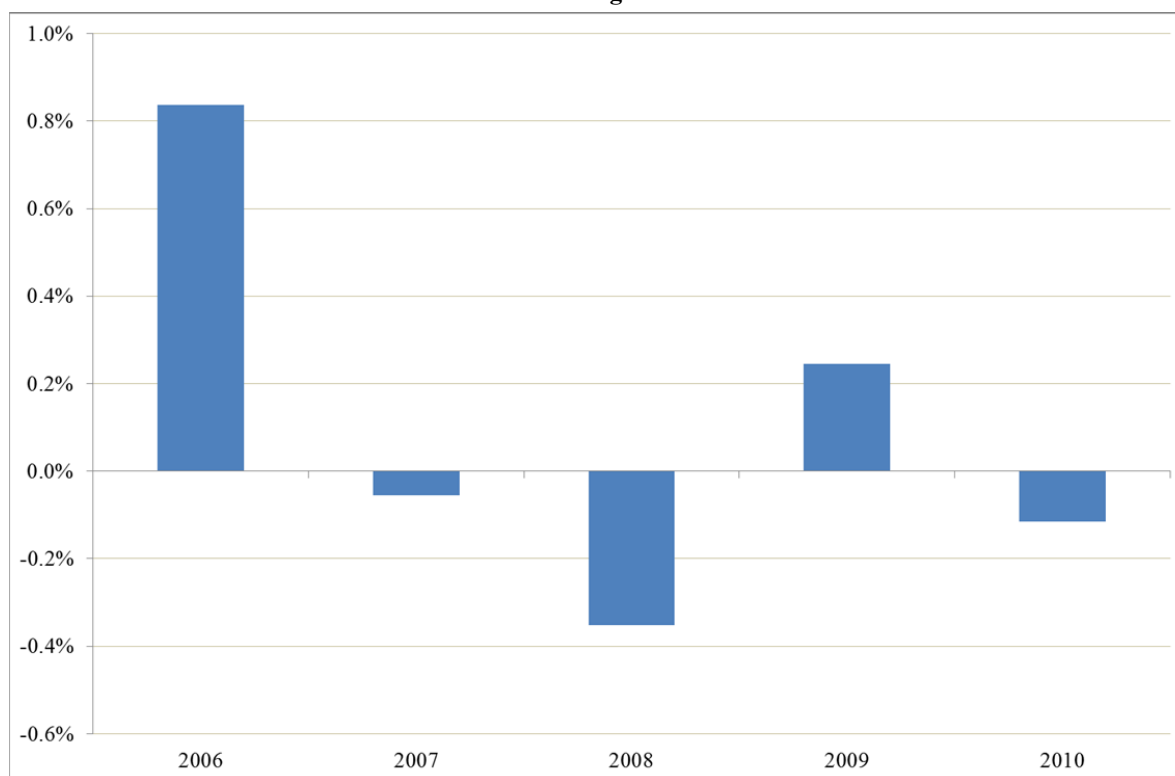
<sup>44</sup> Another line of argument is that the use of exchanges for implicit allocation could boost liquidity on the exchanges, as market participants must use the exchange to 'access' cross-border capacity. However, we are sceptical about this argument. Market participants on the exchange cannot know, and are in fact indifferent, whether their counterparty is located in the same country or not. The only important issues are factors which are visible to the market participant such as the price, bid-ask spreads, credit risk, costs of trading etc. If bids-ask

Nevertheless, even supposing that the factors above reduced the volume of bids and offers that were ‘usable’ for an implicit allocation mechanisms by 50%, the OTC volumes are still around 100 times greater than exchange volumes, with the exception of the French market.

However, it could be the case that even though the volumes traded are relatively small on the exchanges, they are sufficient to give accurate prices and hence get very close to maximising welfare. If this was the case TSOs could still use the exchanges to allocate cross-border capacity with only a small loss of efficiency. To check this, we have compared day-ahead TTF price assessments by Platts – a trade publication – with the APX’s published day-ahead TTF gas price index. Since the Platts’ price assessment is based on the OTC market trades the average difference between these two price sets will indicate the likely level of deviation between exchange prices and OTC prices.

Figure 3 illustrates that the average differences between OTC prices are very small, and in the last few years the prices have varied by only 0.1-0.2%. While we did find some days with larger prices differences, this was quite rare and most days were close to the average difference.

**Figure 3: Average differences between Platts OTC price assessments and the APX price index for day-ahead TTF gas**



spreads were lower or prices for sellers were systematically higher in the OTC market, traders would soon abandon an exchange even if it was used for implicit allocation. In power markets, there is still much more day-ahead OTC activity, even though the exchanges are used to allocate cross-border capacity. More generally, since price differences between the exchange and the OTC markets should be arbitrated away, traders do not need to participate in the exchange to benefit from the effect of cross-border imports or exports.

As a second line of inquiry, we have also looked at the ratio of OTC to exchange volumes for power markets. This is a natural benchmark to use, because TSOs are now commonly allocating cross-border electrical capacity using power exchanges, which presumably means the TSOs think they give an accurate means of allocation. We are not aware of any complaints that the electricity TSOs should use the OTC power markets to allocate cross-border capacity for example. Note that we look at the UK, Germany and France because these were the countries for which we could find data for OTC power trading – we could not find OTC power trading data for the Netherlands.

**Table 7: Ratio of OTC and Exchange volumes for power trading**

				Jun-11	Jul-11	Aug-11
				[A]	[B]	[C]
<b>UK</b>						
OTC and exchange volumes (GWh)	[1]	LEBA		85,346	84,252	91,972
Exchange volumes (GWh)	[2]	APX & EEX		1,299	1,292	1,365
Ratio	[3]	[1]/[2]		66	65	67
<b>Germany</b>						
OTC and exchange volumes (GWh)	[4]	LEBA		362,334	300,921	367,546
Exchange volumes (GWh)	[5]	EEX		18,362	20,136	19,719
Ratio	[6]	[4]/[5]		20	15	19
<b>France</b>						
OTC and exchange volumes (GWh)	[7]	LEBA		48,290	42,292	34,148
Exchange volumes (GWh)	[8]	EEX		4,729	4,617	4,404
Ratio	[9]	[7]/[8]		10	9	8

Table 7 illustrates the ratio of OTC to exchange trading for power market. While OTC volumes are also higher on power markets, the ratio of OTC to exchange volumes is generally lower than for gas markets. The UK market which has the lowest ratio, has OTC volumes that are about 60 times higher than the exchange, but for Germany and France the ratio is about 10-20 – similar to the PEG gas market. Also the absolute volumes traded on power exchanges every month seems to be higher.

We conclude that:

- The volumes of gas traded OTC are significantly higher than exchange traded volumes, so that using OTC bids and offers would offer a significantly larger pool of bids and offers. While this is also true for power markets – which routinely use power exchanges to perform market coupling – the ratio of OTC activity to exchange activity is higher for gas markets.
- However, despite the differences in trading volumes, average prices on OTC markets and the exchange are very close. Perhaps this is not surprising, given that many market parties can observe both OTC and exchange bids and offers, and so there would be arbitrage between the two platforms.

- Given the closeness in prices, and the operational advantages of using exchanges for implicit allocation, we conclude that exchanges would be the preferred platform for implicit allocation using continuous trading.

### **6.3 USE OF A DEDICATED TRADING PLATFORM**

The discussion above has assumed that the TSO would be using the continuous bids and offers in either the OTC or the exchange to allocate cross-border capacity. However, another alternative would be to organise a dedicated auction or trading platform for allocating cross border capacity. For example, the TSOs could call for bids and offers on either side of the border within a specific time frame – for example between 10:00 and 11:00 D-1. The TSOs would use these bids and offers to allocate cross-border capacity. While an exchange could organise this dedicated trading platform, the bids and offers would be separate from the continuous bids and offers made in the rest of the gas market.

As we point out in section 5.1, gas market trading tends to be continuous. This is because the ability to store gas in the pipeline system means that supply and demand does not have to be balanced at every moment, so there is more flexibility as to when trades are made compared to electricity markets.

However, the possible advantage of a dedicated trading platform – or a ‘Batch Auction’ – for implicit allocation is that it could concentrate bids and offers in markets that are otherwise relatively illiquid or thin.<sup>45</sup> In an illiquid market the TSOs may have a better chance of allocating all of the capacity set aside for market coupling than if it relied on allocating capacity using bids and offers as and when they became available. On the other hand, allocating the capacity, in the example, by 11:00 on D-1 may not maximise welfare, if more advantageous bids and offers were made later in the day. Moreover, on further investigation we were not able to find any further studies on why a Batch Auction would offer advantages over continuous trading, even in an illiquid market. We conclude that use of a dedicated trading platform to allocate capacity implicitly is unlikely to be attractive option.

### **6.4 TIME PERIOD**

A further design variable is what capacity products should be allocated by the implicit allocation mechanism – for example monthly, weekly or daily capacity? Ultimately the value of the gas, and therefore of the interconnector is determined by the value of the gas in the moment that it is used. All previous trades are a forecast of this value, which may turn out to be incorrect. Therefore it is most efficient to allocate the cross border capacity based on the most accurate estimate of the value of the capacity, which is the estimate closest to the flow date.

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<sup>45</sup> For example a presentation by Bert Willems of Tilburg University entitled ‘Intraday-trade: Economics refresher’ was given at an NMa workshop. Slides 6 and 8 discuss so-called Batch Auctions and Batch Trading, which are similar to the dedicated trading platform we describe above. The presentation notes that “[b]atch trading is preferred to continuous trading if assets are illiquid”.

A second possible reason why implicit allocation should focus on day-ahead or within day is that the co-ordination problem we identify in section 3.5 becomes more acute the closer the trade is to the flow data or real time, being the time that delivery of the gas must start. For example if a trader was buying and selling gas on a month ahead basis it would have more time to find cross-border capacity to use for the deal.

Finally, as we noted in section 5.6, in many markets the number of longer term contracts traded OTC can be quite small relative to the number of day-ahead products traded. Allocating capacity using a very small number of bids and offers for long-term gas contracts could be inefficient, and would be more open to market manipulation.

We conclude that an implicit allocation mechanisms should focus on short-term capacity products. However, the TSO still needs to decide how much of the available cross-border capacity to dedicate to the implicit allocation mechanism.

As in power markets, it would be logical if un-nominated long-term capacity was made available to the implicit allocation mechanisms via a UIOLI process. The issue is then how much additional capacity to reserve for the implicit allocation process. Reserving such capacity has an opportunity cost. First, as we discussed in section 5.4, underwriting new pipeline capacity with long-term contracts will avoid the ‘hold up’ problem and make it more likely that efficient investment decisions will result. This implies that the majority of cross-border capacity would be sold long-term.<sup>46</sup> Reserving capacity for short-term sale places a risk on consumers, since they would underwrite any revenue shortfall.<sup>47</sup>

Second, capacity dedicated to the implicit allocation mechanism could potentially be used more productively under longer term capacity contracts – for example annual contracts. This is because a gas marketer may want to match the length of a capacity contract with the length of a contract to supply a retail customer, and such contracts are typically for one year.

We note that TSOs will be selling quarterly and longer-term capacity products by explicit auctions in the future. Given that these products are being sold, one possibility would be to allocate month-ahead capacity via an implicit allocation mechanism in parallel to an explicit auction process. Even if the forward market is relatively thin, it is hard to see what disadvantages there would be with allocating monthly or longer term capacity based on bids and offers for monthly gas commodity products, as long as market participants could also make explicit bids for the capacity. One consideration might be that, if the trades are not cleared, then the TSO bears a larger counterparty risk with longer-term trades, since the counterparty has more time to develop credit problems.

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<sup>46</sup> The recommendation that capacity investments should be underwritten by long-term contracts could seem to aggravate the co-ordination problem we identified in section 3.5, since market participants have to go very ‘long’ on capacity. However, such long term capacity contracts tend to be matched with long-term commodity contracts, so that the commitment to the capacity and the commodity deal are made at the same time, thereby avoiding the co-ordination problem.

<sup>47</sup> On the other hand, the marginal capacity gained from adding an extra cm to the pipeline diameter will be relatively cheap. This could reduce the risk for consumers of reserving capacity for the implicit allocation mechanisms.

We conclude that:

- Implicit allocation should focus on short-term products, because this is where the co-ordination problem is likely to be most acute and where there is most liquidity;
- As in power markets, TSOs will need to develop rules of thumb as to how much capacity it makes sense to dedicate to implicit allocation, given the risk that such capacity imposes on consumers and the opportunity cost of denying this capacity to the longer-term capacity market. Attempting to roughly equalise marginal revenues from the different capacity products would be one possible way to divide up capacity products.
- One solution may be that the new capacity created by revised UIOLI mechanisms and the re-nomination limits mentioned in section 3.1 could be sufficient for the implicit allocation mechanism. This would avoid the need to negotiate the surrender of long-term capacity.
- But there would be no harm also allocating longer term capacity via IA, as long as a physical product was also available in parallel via an explicit auction process;

## 6.5 RENT ALLOCATION AND PRICE DETERMINATION

The next question we address is: how should the revenues or rents from implicit allocation be allocated? This is closely related to the issue of the price that traders would receive for their cross-border trades. As we describe above, there will usually be a differences in the price of gas on either side of the border. Prices on either side of the border will certainly diverge when there is physical congestion, but we also see price differences in the absence of physical congestion. These price differences can generate rents or profits, which will accrue to someone. For example, suppose a trader offers to sell gas in country A at a price of €20, and someone in country B is willing to buy gas at €22/MWh. Who keeps the difference between these prices? Should the difference accrue to the traders? Or should the TSO or capacity holder keep the difference of €2/MWh as a ‘congestion rent’?<sup>48</sup>

The sale of cross-border capacity is an important source of revenue for TSOs, and any proposal which changes the way in which cross-border capacity is priced should take this into account. We note that both implicit and explicit allocation mechanisms represent a fundamental change from the traditional method of setting cross-border tariffs based on a cost regulation, which continental TSOs and their regulators have applied up to now.<sup>49</sup>

Both implicit and explicit auctions are likely to yield the same revenues to the TSO, if market participants have perfect foresight. In a competitive explicit auction, parties should bid up to the expected value of the capacity, which is the expected price difference across the border. The implicit auction will yield this value directly from the bids and offers. In reality of course traders do not have perfect foresight, and may over or underestimate the expected revenues from cross-border capacity.

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<sup>48</sup> We call the profits a congestion rent here, even though they may occur even in the absence of physical congestion.

<sup>49</sup> However, National Grid Gas has been setting the price of GB entry capacity by means of an explicit auction for a number of years.

Hence an explicit auction may yield more or less than the implicit auction. However, traders are unlikely to bid systematically too much or too little for interconnector capacity in an explicit auction. Systematically bidding too much for interconnector capacity would result in unsustainable losses. Systematically paying too little would result in other traders realising that money was being ‘left on the table’, and that they could profit from raising their bids for cross-border capacity. Hence on average we would expect implicit auctions and competitive explicit auctions to yield very similar revenues, but explicit auction revenues will vary around the true market value of capacity, as dictated by underlying gas prices, due to forecasting errors by traders.

In electricity markets the difference in cross-border prices is retained as a congestion-rent by the TSO.<sup>50</sup> One argument in favour of this approach is that it seems logical that the person that owns the cross border capacity should retain any differences in power prices. Accordingly a reasonable default assumption is that the TSO would keep the difference between the high price on one side of the border and the low price on the other.

However, because of inefficiencies in gas markets, there will still be price differences between bids and offers in neighboring markets even when there is no congestion on the pipeline connecting them. Indeed it is this inefficiency that implicit allocation is designed to solve. Even though implicit allocation should arbitrage away these price differences as far as possible, the TSO could still keep arbitrage profits that were earned while converging the price differences. Hence even absent congestion, the TSO would still earn revenues from the implicit allocation mechanism.

However, implicit allocation can be designed so that the traders split any price differences. Arguments in favour of this allocation could be that, as in electricity markets, the TSO should only earn congestion rents from the implicit allocation mechanism when there is congestion. Under this approach, absent congestion the TSO could split the difference in prices between the traders on either side of the border.

## **6.6 RESERVE PRICES**

Another issue is whether the implicit allocation mechanism should include a reserve price. This could be implemented by, for example, the TSO requiring a minimum difference between buy and sell bids and offers on either side of the border before it is prepared to allocate capacity to the trade. This would be the equivalent of a reserve price in an explicit auction.

A reserve price only becomes relevant absent congestion. With congestion, shippers will likely bid up the price of cross-border capacity to above its long-run cost, and so the market price for capacity will exceed any reasonable reserve price. The absence of congestion combined with auctions with no reserve price could mean that short-term market based capacity prices will be zero, and the issue of a reserve price becomes relevant.

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<sup>50</sup> Article 16(6) of Regulation 714/2009 states that any revenues resulting from the allocation of interconnection capacity must be used for either guaranteeing the actual availability of the allocated capacity and/or maintaining or increasing interconnection capacities through network investments, in particular in new interconnectors.



The issue of reserve prices raises complex issues, and there are arguments both for and against a reserve price. The main argument against a reserve price is that it will stop welfare enhancing trades from taking place. Using a reserve price – so in other words where the TSO only allocates capacity to a pair of trades if there is a minimum price difference – would mean that the gains that we calculate in section 4.2 would not be realized. The TSO would always leave a minimum price difference between markets. The main benefit of the implicit allocation mechanism is to make trading more efficient and converge cross-border price differences. But the use of a reserve price would make this task impossible, rendering the implicit allocation mechanism pointless.

Arguments for a reserve price relate to issues of cost-recovery. For short-term explicit auctions, without a reserve price and absent congestion, shippers could decide to stop booking annual capacity and rely on cheap or free short-term capacity. Un-booked long-term capacity would then roll over into the short-term mechanism, until eventually all of the capacity at the border is being sold for little or nothing. In this case TSOs would have to recover revenues from domestic consumers to make up the revenue shortfall.

The equivalent situation with an implicit allocation mechanism is that shippers would stop buying long-term capacity and instead ‘transport’ gas by buying and selling on the trading hubs. Again, this would only be a problem if unused long-term capacity rolled-over into the implicit allocation mechanisms until all cross-border capacity was being used for implicit allocation.

However, this ‘flight to short-term capacity’ scenario only seems plausible if there is little or no risk that congestion will arise at some point. If there is a risk of congestion, then shippers will be reluctant to move away from long-term contracts. Even a small episode of congestion could substantially increase the average cost of supplying gas from country A to a customer in country B. Since many shippers supply gas on a narrow margin, most shippers would rather hedge their transport costs by buying longer term capacity. It seems unlikely that shippers would move away from long terms contracts unless they were almost certain congestion would never occur.

More generally, the need for reserve prices could be avoided if capacity expansion decisions are underwritten by long-term capacity contracts. In this case there are also no efficiency consequences for the absence of a reserve price for an implicit allocation mechanism. Shippers could not all move to short-term contracts as in the scenario described above.

For interconnection points where there was no risk of congestion one could avoid the ‘flight to short-term’ scenario by limiting the capacity dedicated to the implicit allocation mechanism. But un-booked long-term capacity would need to be sold somewhere, and the most likely solution would be for it to roll-over into an explicit short-term auction with a reserve price. In this case, as more shippers tried to transport gas by buying and selling on the hubs, the capacity dedicated to the implicit allocation mechanism would become congested, and price differences would arise. However, the natural cap for the price differences for the markets would be the short-term reserve price.

For example, suppose that, due to implicit allocation and a lack of congestion, the price difference between trading hubs of markets A and B was €0/MWh, but short-term and long-term capacity from A to B was sold at a reserve price equivalent to €1/MWh. Why would shippers buy

capacity at a price of €1/MWh, when they can simply sell gas in country A and buy it back in country B for the same price? If all shippers tried this, the capacity dedicated to implicit allocation would become constrained, and prices would fall in country A and rise in country B. Perhaps the price difference would rise to €2/MWh, in which case some traders would shift back to using the short-term capacity. In equilibrium the price difference between the markets would equal the price of short-term capacity. Therefore, there is a risk that, in the presence of explicit auctions with reserve prices, the implicit allocation mechanism will not achieve its objective of price convergence.

Alternatively, the TSO could accept that capacity on the uncongested interconnection point has a low or zero value, and raise the required revenues from other more congested interconnection points, if such points exist on the TSO's network.

### **6.7 SHOULD IMPLICIT ALLOCATION BE AN EXCLUSIVE MECHANISM?**

If TSOs allocate capacity via an implicit allocation process, does it make sense to allocate the same capacity product via an explicit auction in parallel? For example, if the TSOs allocated day-ahead capacity using implicit allocation, would there also be a need for an explicit auction for day-ahead capacity? For example, the TSO or MO could sell 200 GWh/day of cross-border capacity day-ahead. They could allocate the capacity via an implicit allocation mechanism according to the bids and offers in the commodity market, but also allow traders to make direct offers for a given amount of capacity in a 'rolling explicit auction'. If the value of the direct offer for capacity exceeded the value implied by the bids and offers in the commodity market, the MO could sell the capacity directly to a market as a PTR.

For example, in the GRTgaz market coupling mechanism it is possible to make explicit offers for capacity between PEG Nord and PEG Sud at the same time as GRTgaz is allocating capacity using implicit allocation. For example, if there is an offer to sell for €20/MWh in PEG Nord, and an offer to buy for €20.5/MWh in PEG Sud, then the implied value of capacity is €0.5/MWh. But a market participant would be able to offer €0.7/MWh for capacity, in which case GRTgaz would offer the capacity to that market participant.

By allowing market participants to bid directly for inter-zone capacity, the GRTgaz system implies that there may be 'missing' bids and offers in the market. For example, suppose bids and offers implied an inter-zone capacity value of €0.5/MWh, being the difference between the buy and sell price in the two zones. If a market participant bid €0.7/MWh for the capacity, this must mean that there is actually a higher bid to buy or a lower offer to sell than has been advertised on the trading platform. In the case of GRTgaz, given that OTC offers will not appear on the Powernext platform, the possibility of missing bids and offers seems plausible.

We conclude that it would seem logical to allocate all the capacity via an implicit mechanism if the TSOs are confident that the system has an overview of almost all the available bids and offers in the market. But if some bids and offers are missing from the market coupling mechanism, then it could make sense to have explicit auctions in parallel as in the GRTgaz system. Allowing direct offers for capacity could also help raise confidence in the in the early stages of implicit allocation, if the values generated by both explicit and implicit allocation mechanisms are similar. Once

confidence in the implicit allocation mechanism is established, the explicit auction mechanism could be phased out to make way for all capacity to be allocated by the more efficient implicit allocation mechanism which overcomes co-ordination issues.

However, rules would need to be in place to ensure that any capacity sold explicitly is actually used, and that dominant traders cannot divert capacity from the implicit allocation mechanism and then withhold it. This could be achieved if buyers of short-term capacity were obliged to also submit irreversible nominations if they are successful in buying capacity. There could also be rules in place to limit the short-term capacity that any one party or its affiliates can buy.

## **7 EVALUATING ALTERNATIVE IMPLICIT ALLOCATION MECHANISMS**

### **7.1 DEFINING ALTERNATIVE IMPLICIT ALLOCATION MECHANISMS**

Based on the earlier discussions, we have developed several alternative implicit allocation mechanisms for comparison. While some of these models contain elements that we have concluded are unlikely to be optimal, we evaluate them in this section for completeness. We have designed the options so that they could in theory be applied between any pair of market areas within the EU.

#### **Option 1: Multiple Allocation Windows**

Under this option, the TSO reserves a certain amount of firm cross-border capacity to be allocated implicitly. The TSO – or the agent that it delegates to execute implicit allocation<sup>51</sup> – would then define a number of time windows when capacity would be allocated. For example, the agent could choose to allocate capacity in four sessions, spread throughout the gas day, and divide the available capacity evenly between the sessions. So if the TSO had made 200 MW of capacity available for implicit allocation, the agent could start allocating 50 MW at D-1 06:00, 50 MW at 12:00, 50 MW at 16:00 and 50 MW at 20:00. At the start of each allocation window, the agent would examine qualifying bids and offers on a continuous basis, and rank them using the methodology illustrated in Table 1, Table 2 and Table 3. The agent would execute cross-border trades, buying on one side of the border and selling on the other using the capacity set aside for implicit allocation, until all of the capacity for that allocation window is fully utilised. If not all of the capacity was allocated by the time the next allocation window opened, then the un-allocated capacity would be rolled over into the next allocation session. We assume that initially capacity will be allocated on a day-ahead and perhaps a within-day basis. Under this system the TSO would keep the difference between the selling price and the buying price as a congestion rent.

The purpose of the multiple allocation windows is to avoid the ‘regret value’ of allocating all of the available capacity within the first hour, to then find that more welfare enhancing bids and offers materialise later in the gas day. While the use of multiple allocation windows does not mean that welfare will be maximised, it at least reduces the risk of extreme outcomes.

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<sup>51</sup> In practical terms, it would seem likely that the TSOs on either side of the border would establish a joint-venture agency to execute this trading activity, so that both TSOs share the risks and rewards of implicit allocation.

The scheme could be implemented using either OTC bids and offers or bids and offers from the exchange. In the case of OTC bids and offers, the TSO or its agent would pre-qualify a group of traders who have an acceptable credit rating, and with whom the TSO is willing to trade. The TSO would also specify the form of the standard EFET contract which it is willing to use.<sup>52</sup>

Using OTC bids and offers, trades are not cleared, and the TSO/agent bears counterparty risk, although this will be relatively small if the trading is limited to day-ahead and within-day, as the time for the counterparty to develop credit problems is very short. The TSO/agent would need to settle the terms of the transactions, and deal with any issues or disputes such as the cancellation of transactions. The TSO/agent would also arrange settlement.<sup>53</sup>

This scheme could also be executed using the bids and offers on cleared gas exchanges, such as APX-ENDEX and the EEX. In this case the trades would be cleared and the TSO/agent would not bear any counter-party risk. Accordingly there would be no need to specify credit terms or pre-qualify counter parties, since the exchanges have already performed this task. The exchanges also specify rules for the amount of collateral that counter-parties must post. The exchanges would also arrange settlement.

Since the allocation mechanism uses only bids and offers from the exchanges, then the process could perhaps be more heavily automated, and the TSO/agent would not have to be directly involved in executing trades. As with market coupling in power markets, the TSOs role could be limited to making the firm capacity available for the implicit allocation to the exchanges.

We consider that, on balance, a larger degree of automation with less risk for the TSO or its agent will be desirable. We recognise the advantages of using more numerous OTC bids and offers, but this is offset by increased risks and responsibility for the TSO. We conclude that while there is less liquidity on exchanges, this is unlikely to make a material difference to the efficiency of the capacity allocation. Organisationally the advantages of using existing exchange infrastructure, which is well suited to the application of implicit allocation, outweighs the potential disadvantages.

### **Option 2: ‘Super Trader’**

Option 2 would be similar to the option described above, except that decisions regarding which trades to allocate capacity to would be left to the discretion of an agent or ‘super trader’. Instead of capacity being allocated during defined windows, the agent would use its judgement as to which trades would most enhance welfare. This alternative is attractive if one believes that a trader may have some insight into when the price differences across the border are likely to be at their highest level, which a more prescriptive or automated system as described above might miss. If this is the case, the agent may do a better job of maximising welfare than option 1. In many ways the role of the

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<sup>52</sup> A list of EFET contracts can be found at [www.efet.org/Standardisation/Gas\\_4841.aspx?urlID2r=15](http://www.efet.org/Standardisation/Gas_4841.aspx?urlID2r=15).

<sup>53</sup> While the role of trading is arguably not a core function of a TSO, some TSOs already trade actively in the market for the purposes of system balancing – National Grid Gas (NGG) in the UK is a prominent example. Although it trades on the On-the-day Commodity Market which is a cleared exchange. Trading for the purposes of capacity allocation would represent an extension of this role.

super trader is similar to that of the ‘market maker’ role, in which a market participant makes simultaneous bids and offers in the market so as to promote liquidity.

Under this option, the agent could be free to a mix of exchange and OTC bids and offers. However, it would be important that the agent is responsible for providing its own collateral, so that it could make proper judgements regarding the risk of OTC trading vs. exchange trading.

This option would also require some kind of incentive scheme for the agent – otherwise it could simply allocate all of the capacity in the first 10 minutes in a way that minimises its efforts but does not maximise welfare. For example, the agent or super trader could be given an increasing share of the congestion rents or charged a penalty, depending on how well it maximised welfare based on an *ex post* estimate of the maximum possible welfare enhancement possible, made after the end of the gas day.

### **Option 3: Combined Order Books**

In Option 3, rather than appointing a market agent it would be left to market participants to allocate cross-border capacity via their trading activity. Specifically, the ‘order books’ –which is to say the schedule of bids and offers of the exchanges – could be combined, so that buyers in country A would be able to see offers from country B as if they were in the same country. For example, if there was implicit allocation between Germany and the Netherlands, buyers using the APX-ENDEX day-ahead market who wanted gas at TTF would be able to see offers made by seller at Net Connect Germany (NCG) as if it were being offered at the TTF. Similarly, buyers at NCG would be able to see offers at TTF as if they were made at the NCG. In other words, market participants would not be aware that they were in fact looking at bids and offers made on another market hub. Trade would continue as normal, but the exchanges would monitor the trades which involved cross-border transactions, allocate cross-border capacity to these transactions, and then nominate the required cross-border flows. When all the available cross-border capacity had been allocated, the market participants would no longer be able to see bids and offers from the neighbouring market.

As with option 1, to avoid all the available short-term capacity being used up in the first hour – which may not maximise welfare – the combining of order books could take part in distinct time windows. The market participants need not be aware of these windows, but would simply see more bids and offers become available on their screen as the window opened, and some bids and offers disappear when the available cross-border capacity was exhausted.

Under this option, rather than the TSO retaining congestion rents, they would accrue directly to market participants. For example, if there was an offer to buy at €22/MWh in country A and an offer to sell at €21/MWh in country B, a trader could arbitrage and profit from this price difference without the need to buy any cross-border capacity.

We understand that this system is similar to the method of intra-day capacity allocation used in the intraday Scandinavian electricity market (Elbas).

### **Option 4: Dedicated Trading Platform**

Under this option, rather than using OTC or exchange bids and offers, there would be a dedicated platform on which market parties could make bids and offers for the purposes of implicit capacity allocation. Within a defined period, for example between 12:00 and 13:00 day-ahead, market participants on either side of the border would submit bids to buy and offers to sell gas on the auction platform. The TSO would need to pre-qualify participants, and specify a standard form of contract for bids and offers including collateral requirements. The TSOs would then select the cross-border trades which maximise welfare. The TSOs would then inform the parties whether their bids and offers had been accepted or not, and flows allocated by implicit auction would be fixed at some point day ahead e.g. 16:00 D-1. The TSO would act as the counter party to the trades, buying on one side of the border while simultaneously selling on the other. The TSO would therefore bear counterparty risk, although this could be heavily mitigated with suitable collateral specifications.<sup>54</sup>

Under this option, the TSO would need to provide parties with some incentive to make bids and offers on the auction platform. Otherwise, market parties would likely prefer to make their bids and offers on an exchange or on the OTC markets, where they would face a greater pool of counterparties and therefore be better placed to achieve their desired price. Accordingly, it seems likely that to incentivise traders to use the platform the TSOs would have to share some of the congestion rents with them, thereby offering them better prices than they could achieve on the OTC markets or on the exchange. The TSOs would need to experiment with the amount of congestion rent they need to share to get a sufficient level of participation on the platforms.

This option could also be designed as a series of auctions, with each subsequent auction using capacity that had not been allocated in the previous auctions, if any. Under this variant the bids and offers should be for within-day gas products with delivery periods over part of the day, since some of the auctions likely take place after the start of the gas day. Alternatively, bids and offers in earlier auctions could be interruptible, so that they can be displaced by bids and offers from subsequent auctions which are more welfare enhancing. Under this variant, final allocation may not take place until a few hours before the delivery hour. In Table 8 we summarise the main characteristics of the four different options we have developed.

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<sup>54</sup> This option could also be designed so that one of the exchanges manages the platform and acts as a central counterparty. However, it is not clear that the exchanges would want to participate in a platform that competes with their own established trading venues.

**Table 8: Summary of the characteristics of different implicit allocation design options**

<b>Characteristic</b>	<b>Option 1: Multiple Allocation Windows</b>	<b>Option 2: ‘Super Trader’</b>	<b>Option 3: Combined Order books</b>	<b>Option 4: Dedicated Trading platform</b>
<b>Trading Platform Used</b>	Exchanges.	Exchanges and/or OTC markets.	Exchanges.	Dedicated trading platform.
<b>Rent Allocation</b>	Rents will go to the TSOs.	Some rents must be diverted to incentivise the ‘super trader’. The remaining rents will go to the TSOs. However, if the incentive scheme is well designed, TSO rents should be higher than Option 1.	All rents accrue to the traders.	The TSOs would need to share some of the congestion rent with traders to incentivise their participation on the platform. The remaining rents would go to the TSOs. Therefore this option would yield lower revenues to the TSOs than Options 1 and 2.
<b>Role of the TSOs</b>	TSOs would need to transfer short-term capacity for the exchanges to use in the allocation mechanism.	TSOs would need to transfer short-term capacity for the super trader to use. The TSO would also need to manage the super trader and act as its manager/employer.	TSOs would need to transfer short-term capacity for the exchanges to use in the allocation mechanism.	TSOs would need to establish and run the trading platform, although this could be outsourced. The TSOs would pre-qualify participants and act as the central counterparty, clearing and settling trades.

## 7.2 CRITERIA AGAINST WHICH TO EVALUATE ALTERNATIVE CAPACITY ALLOCATION MECHANISMS

The next step is to evaluate and rank the alternative options for implicit allocation, both against each other and against other likely allocation mechanisms such as explicit allocation. We have chosen the following criteria which serve both to define the options and help evaluate them:

1. **Welfare maximisation** – The allocation mechanisms should allocate capacity to the market parties whose trades will maximise welfare. As explained in section 6, this means allocating capacity to a seller with the lowest offer price and the buyer with the highest bid price. The main challenge in implicit allocation is that the welfare maximising set of trades to which the mechanism should allocate capacity is not known until after the end of the gas day. It is always possible that the most welfare enhancing set of bids and offers materialise in the last 30 minutes of the gas day, in which case there will be a ‘regret value’ if capacity has already been allocated to less welfare-enhancing trades earlier in the day. The various mechanisms attempt to control for this risk in different ways – option 1 spreads out the allocation of capacity throughout the day; option 2 relies on a super-trader using good judgement; and option 3 hopes that market participants may facilitate the allocation process. It seems hard to say in advance which of the mechanisms would lead to higher welfare gains.
2. **Costs and feasibility of alternative capacity allocation mechanisms** – The third evaluation criterion is the cost of implementing the mechanism, combined with how feasible or practical it is in terms of the risk that there could be technical problems with implementation due to complexity.<sup>55</sup> We understand that the problems with implicit allocation in power markets were associated with the presence of ‘block bids’ – so bids in hours that are conditional on the acceptance of bids in other hours – which significantly complicate volume coupling. This specific problem would not be present in gas market coupling, since the issue of block bids does not arise.<sup>56</sup> However, there could perhaps be other risks with a new implicit allocation mechanism for gas transport capacity that should be taken into account.
3. **Ability to Combine with Explicit Auctions** – As we noted in section 6.7, there could be advantages in allowing market participants to make direct bids for cross-border capacity via an explicit auction that could take place at the same time as the implicit allocation. Therefore it seems relevant to also consider how easily each mechanisms could accommodate an explicit auction mechanisms. In each case it would be possible for the

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<sup>55</sup> For example, some electricity markets have experienced problems with market coupling schemes that resulted in a temporary suspension of trading. One example is the Kontek cable between Germany and Denmark, where volume coupling was abandoned after a short period because of problems with the pricing algorithm. For more details see ‘Report on Supervision of Tests and Evaluation of a System for Market Coupling operated by EMCC’ available at [http://www.marketcoupling.com/document/1125/External\\_EMCC-Report.pdf](http://www.marketcoupling.com/document/1125/External_EMCC-Report.pdf)

<sup>56</sup> Block bids are used in power markets because a power plant incurs start-up costs, and therefore may not want to start up only to run for one or two hours. Block-bids are used to guarantee a minimum number of consecutive running hours. There is no analogous reason for the use of block bids in gas markets.



TSO to reserve some short-term capacity for an explicit auction as well as allocating capacity implicitly. However, as with the GRTgaz mechanism discussed in section 6.7, some implicit auction mechanisms could allow a continuous comparison of the value of capacity implied by bids and offers in the gas market and the value based on direct or explicit offers to buy capacity.

4. **Effect on liquidity relative to explicit auctions** – what effect might the implicit allocation mechanism have on liquidity, relative to a system where explicit auctions allocate cross-border capacity?
5. **Impact on normal market functioning** – is the allocation mechanism consistent with the existing characteristics of the gas market which we describe in section 5?

### **7.3 COMPARISON OF ALTERNATIVE IMPLICIT ALLOCATION MECHANISMS**

Table 9 over page summarises the characteristics of the different implicit allocation mechanisms and evaluates them against the criteria.

**Table 9: Evaluation of alternative capacity allocation mechanisms**

	Options					
Criteria	Option 1: Multiple Allocation Windows	Option 2: 'Super Trader'	Option 3: Combined Order books	Option 4: Dedicated Trading platform	Explicit Auction	FCFS/cost-based tariff
<b>Welfare Maximisation</b>	By allocating capacity at set times using a simple algorithm, Option 1 should avoid 'extreme' welfare outcomes. However, while option 1 avoids allocating all capacity in the first hour of the gas day, it may also miss the most welfare enhancing trades.	If the incentives are well designed, Option 2 should yield higher welfare gains than other options, since the trader should be able to use its judgement to produce better welfare increases than a more mechanical approach. If this is not the case then this option should be abandoned.	We expect that the welfare gains would be very similar to option 1. Traders should immediately arbitrage any price differences they see, even if price differences however small. We do not expect traders to wait until there may be larger welfare gains later on the day.	The efficiency of Option 4 depends strongly on the popularity of the auction platform, which in turn depends on the degree of congestion revenue sharing. However, it is hard to see why Option 4 would be more efficient than Options 1, 2 or 3, and is likely to be the least efficient unless the available OTC and exchange platforms are extremely illiquid.	As described in the body of the report, explicit auctions could be less efficient than implicit allocation if traders are adverse to buying capacity in advance of knowing its actual value.	FCFS will be the least efficient mechanism, since capacity will be allocated to the parties that request it first, rather than the trades that will maximise welfare. Pricing capacity above its market value is inefficient, since capacity that would be welfare enhancing is unsold and unused.
<b>Costs and Feasibility</b>	Trades would be cleared, which reduces counter-party risks. However, the system would require the development of software to implement trades, across two or more exchanges, which entails some technical risk.	There would be no changes to system required. the Regulatory Authorities would need to develop an incentive scheme for the trader, but this seems relatively simple as all the parameters are measurable. If the super trader does less well than other options the scheme could be abandoned.	As with option 1, the system would require modification of exchange software to allow the combination or order books within specific periods. As with any modification there is some technical risk involved.	The TSOs would need to develop an auction platform on which parties could submit bids and offers. The TSOs would bear the counterparty risk and trades would not be cleared. Little technical risk.	TSOs would need to establish an auction platform. Explicit auctions are a well-established allocation mechanism, so there seems to be little technical risk.	Status quo, so no additional costs or additional risk.

	Options					
Criteria	Option 1: Multiple Allocation Windows	Option 2: 'Super Trader'	Option 3: Combined Order books	Option 4: Dedicated Trading platform	Explicit Auction	FCFS/cost-based tariff
<b>Ability to Combine with Explicit Auctions</b>	It would be feasible to allow traders to make direct bids for capacity – the exchanges/algorithm could divert capacity from the implicit allocation mechanism to traders if their offers for capacity exceeded the value implied by bids and offers in the gas market.	As with option 1, the super-trader could also sell capacity directly to other traders, if this was more profitable than using the capacity for trading.	It would not be possible for traders to divert capacity from the implicit allocation mechanisms under this option. However, an explicit auction could be held in parallel.	It would be possible for traders to make direct offers for capacity on the same platform at the same time. The TSO could then compare explicit offers with the value implied by cross-border commodity prices.	Not applicable.	Not applicable.
<b>Effect on liquidity relative to explicit auctions</b>	Positive effect on liquidity – should increase cross-border trading.	Positive effect on liquidity – should increase cross-border trading.	Positive effect on liquidity – should increase cross-border trading.	Could reduce liquidity by diverting bids and offers from existing OTC markets and exchanges.	Not applicable.	Not applicable.
<b>Impact on normal market functioning</b>	No disruption – there would simply be another trader active on the exchange. Other traders should be unaware of any change.	No disruption – there would simply be another trader active in the market.	Could be disruptive to trading in that, during the allocation windows, an additional group of bids and offers will suddenly 'appear' on trading screens, and likewise disappear when the window closes. Traders could wait until the windows opens before trading.	Would introduce a new trading platform. Is not consistent with the continuous manner of trading in the market as described in section 5.1.	This represents the future 'business as usual' scenario and so would not be disruptive.	This represents the old 'business as usual' scenario and so would not be disruptive.

#### **7.4 CONCLUSIONS ON ALTERNATIVE MECHANISMS**

We conclude that option 4 – a dedicated trading platform – has a number of significant disadvantages and should not be pursued further. The most significant disadvantages are the role of the TSOs in the trading process, and the risk of reducing liquidity for existing trading venues. It may be perceived that a dedicated platform could allow the TSO to optimize capacity allocation by ranking a large set of bids and offers in a single time period. But there is no guarantee that using the bids and offers which materialize on the dedicated platform to allocate capacity would be more welfare enhancing than using either exchange or OTC bids and offers.

Of the other options considered, the most significant difference between them is that under Option 3 – Combined Order Books – the TSOs would not receive any of the congestion rents. As we noted in section 6.5 this is a policy decision for which there does not seem to be a correct analytical answer. We noted in the table that Option 3 may be slightly more disruptive to the market as trades would appear and disappear from screens, but this disadvantage does not seem so significant as to rule out the option.

Between options 1, 2 and 3, it is not possible to say in advance which would lead to the largest welfare increases. We recommend that a trial is organized involving at least either option 1 or option 3, to determine experimentally which mechanism performs better.

## Appendix I: Quantifying the Benefits of Implicit Allocation

We identified ‘inefficient’ hours as hours where there was a price difference but there was spare capacity in the pipeline. For these inefficient hours, we then calculated what gas prices would have been in the connected countries, if there was efficient arbitrage. We did this by taking a demand-weighted average of the ‘inefficient’ prices, on the basis that the price of the country with smaller demand would move further toward the new single price than the country with larger demand. For example, suppose that in country A demand was 1,300 GWh and the inefficient price was €20/MWh, and in country B demand was 700 GWh and the inefficient price was €18/MWh. The new single price would be calculated as  $(1,300 \times 20 + 700 \times 18) / (700 + 1300) = 19.3$ .

Figure 4 illustrates how we estimate the additional gains from trades as a result of implicit allocation. The initial (pre-implicit allocation) price in country A is  $P_A$ , and the initial price in country B is  $P_B$ . As more gas flows from country B to country A, the prices in the two countries converge. Effective demand in country B increases, and effective supply in country A increases. The flow  $Q$  is the flow required to equalise prices in the two countries. The areas of the blue triangles represent the welfare gains from the additional trading. In country B, the price rises to  $P_S$ , and the blue triangle in the left panel of Figure 4 represents the net increase in welfare. In country A, the price falls to  $P_S$ , and welfare increases by the blue triangle in the right panel.

**Figure 4: Illustration of the supply and demand shifts from additional trading due to implicit allocation**

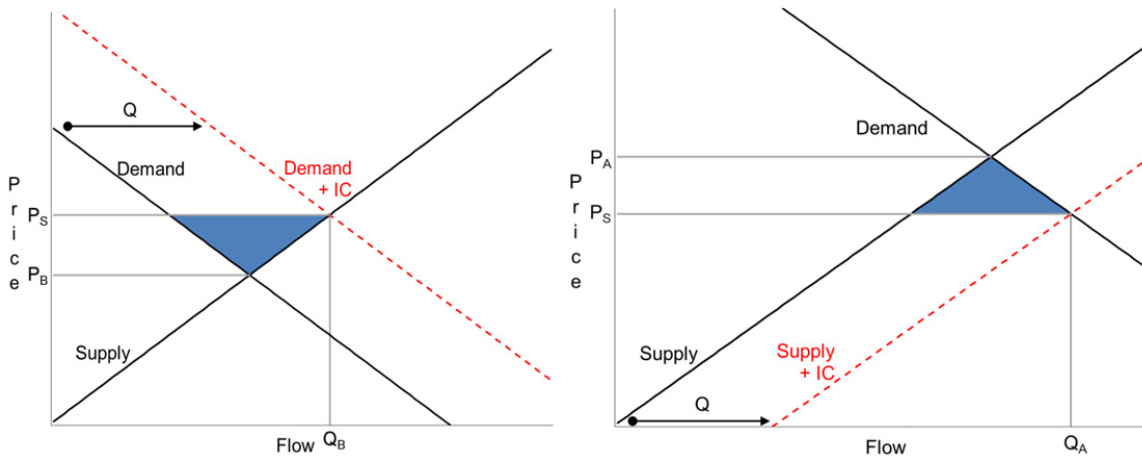
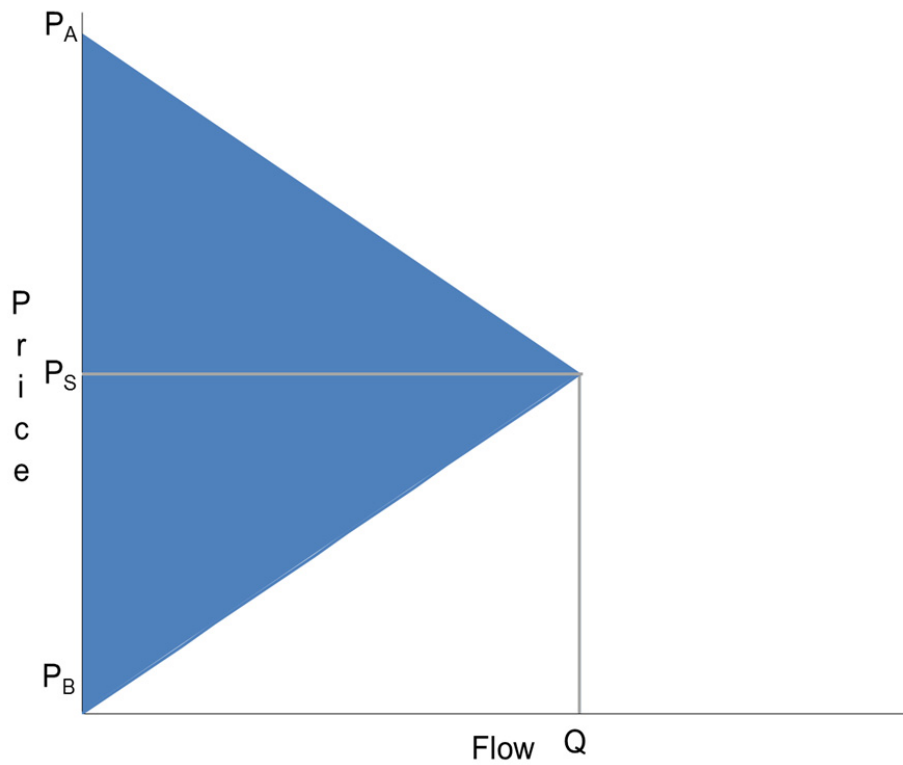


Figure 5 aggregates these savings, showing the consumer savings from country A as the triangle above the new price,  $P_S$ , and the supplier savings from country B as the triangle below the new price.

**Figure 5: Illustration of the welfare gains from additional trading due to implicit allocation**



We take the case that there is always sufficient spare capacity to equilibrate prices. That is, we do not apply a function which estimates the degree to which prices would move as a function of changes in cross-border flows. In our calculations  $Q$  is simply the unused cross-border capacity for each day, and it is always assumed to be sufficient to equalise prices. In reality this may not always be the case, and so prices may not fully equalise and the welfare gain would be less than we estimate. Therefore our calculation represents an upper limit on the welfare gains that occur as a result of implicit allocation.

## Appendix II: Nomination schedules

**Table 10: Renomination schedules**

Country	Operator	Specificities	Nomination (mandatory) deadline	Revision for the Nomination (optional) deadline	D-1 Renomination (optional) deadline	Free Cycle Renomination
The Netherlands	GTS	TTF	14:00 on D-1	16:00 on D-1		30 min in advanced of the delivery hour
		Non TTF	14:00 on D-1	16:00 on D-1		2 hours in advanced of the delivery hour
Belgium	Fluxys		14:00 on D-1	16:00 on D-1	20:00 on D-1	Any time between 4:00 D-1 and 2:59 D
France	GTR Gaz		14:00 on D-1	16:00 on D-1	20:00 on D-1	Any time between 4:00 D-1 and 3:00 D
Germany	Thyssengas		14:00 on D-1	16:00 on D-1	20:00 on D-1	2 hours in advanced of the delivery hour
Germany	Wingas		14:00 on D-1	16:00 on D-1	20:00 on D-1	2 hours in advanced of the delivery hour
Germany	ENI		14:00 on D-1	16:00 on D-1	20:00 on D-1	2 hours in advanced of the delivery hour
Germany	Opengas		14:00 on D-1	16:00 on D-1	20:00 on D-1	2 hours in advanced of the delivery hour
Germany	Thyssengas	Day-ahead capacity	20:00 on D-1	None	Not allowed	Not allowed
Germany	Wingas	Day-ahead capacity	20:00 on D-1	None	Not allowed	Not allowed
Germany	ENI	Day-ahead capacity	20:00 on D-1	None	Not allowed	Not allowed
Germany	Opengas	Day-ahead capacity	20:00 on D-1	None	Not allowed	Not allowed

Notes and sources:

[http://www.gastransportservices.nl/en/shippers/operational/nomination\\_matching](http://www.gastransportservices.nl/en/shippers/operational/nomination_matching)

[http://www.fluxys.com/en/Services/Transmission\\_1/ServicesAndModels\\_1/DomesticTransmissionServices\\_A.aspx](http://www.fluxys.com/en/Services/Transmission_1/ServicesAndModels_1/DomesticTransmissionServices_A.aspx)

<http://www.grtgaz.com/en/home/transmission/transmission-contract-in-force/>

[http://www.wingas-transport.de/download\\_netzzugang.html?&L=1](http://www.wingas-transport.de/download_netzzugang.html?&L=1)

<http://www.open-grid-europe.com/cps/rde/xchg/SID-ECDAA58D-496B683D/open-grid-europe-internet/hs.xsl/2578.htm?rdeLocaleAttr=en>

<http://www.thyssengas.com/web/cms/en/241628/thyssengas/network-access/download-area-network-access/>

[http://www.enid.it/inglese/servizi\\_condizioni\\_en.htm](http://www.enid.it/inglese/servizi_condizioni_en.htm)

### Avoiding re-nomination restrictions

Another potential advantage of implicit allocation is that it could overcome inefficiencies associated with restrictions on re-nominations. For example, suppose that a trader undertook a trade, day-ahead (D-1), buying gas in country A for €19/MWh and selling it in country B for €21/MWh. The trader nominates a cross border flow which is fixed at 20:00 D-1. Suppose that subsequently on-the-day prices change, so that the price in country A is now €20/MWh, and the price in country B is €19.5/MWh. The trader would like to unwind its position, selling gas in country A for €20/MWh, and meeting its obligation in country B (to sell at €21/MWh) by buying cheaper within-day gas at €19.5/MWh. The trader would like to cancel the original cross-border flow and schedule a flow in the opposite direction. But if the ultimate re-nomination window has closed, this would not be possible. The trader would be forced to flow from the high price to the low price country on-the-day. Implicit allocation could avoid this, since the TSO would not be affected by any restrictions on re-nomination, and could simply re-schedule the flows (though the details would depend on the precise implicit allocation method design).

However, it is also important to note that at present the problem above is largely theoretical – in reality the renomination rules, which we summarize in Appendix I, are very flexible. Shippers can re-nominate flows up to two hours before the flow hour. Nevertheless, we understand that it is possible that new day-ahead capacity products could be launched in future which would have a

final nomination deadline of 20:00 D-1, in which case the issue described above could materialize.



### Appendix III: Reasons for leaving physical transmission rights

In gas markets there is a strong case for long-term physical transmission rights (PTRs)<sup>57</sup> to transport the large volumes traded cross-border. This is because, as we note in section 5.2, the cross-border flows of gas are large relative to total market demand. With implicit allocation the only way to transport gas cross-border would be to sell gas in the exporting market and buy gas in the importing market. But given the volumes involved such a solution would be impractical for all cross-border trades. Moreover, the Financial Transmission Rights or FTRs that could be used to hedge cross-border congestion risks in power markets would not work well in gas markets.

If all cross-border capacity was dedicated to market coupling, it would not be possible to buy any cross-border capacity to physically nominate flows – in other words PTRs. Instead, parties who had undertaken long-term gas commitments would have to transfer gas from country A to country B by selling gas in country A and buying in country B. This of course introduces price risks, since the difference in prices between country A and country B may not match the price in the contract. In other words, the implicit price of cross-border capacity, being the difference in prices between country A and country B, will vary in a way that creates commercial risk. In some electricity markets, parties hedge this risk by buying so-called Financial Transmission Rights or FTRs.<sup>58</sup> The FTR entitles to holder to receive the congestion rents that arise on the cross-border interconnectors.

For example, suppose that a seller in country A has a long term contract to buy gas from a producer for 20, and re-sells the gas under another long-term contract to a buyer in country B for a price of 21 (we omit the units in this example since they do not affect the result). Suppose also that all the cross-border capacity is now dedicated to day-ahead market coupling, and the interconnector is congested so that prices in country A and country B have diverged. To ‘transport’ the gas from country A to country B, the seller sells the gas for a price of 19 in country A, which is the spot price on that day. It then buys the same volume of gas in country B for a price of 22, the spot price in country B on that day. In total the seller’s outgoing cash flows are -20 and -22, so -44. The cash inflows are 19 and 21, giving a total of 40. Net cash flows are -2, because of congestion on the border and the resulting price differences. However, suppose that the seller holds an FTR, which gives it the cash flows from the difference between the price in the two countries – in this example 22 less 19 which equals 3. Adding the FTR income, the seller has a net cash flow of 1, which is the same as the profit under the original deal. The FTR has hedged the seller against the risk of cross-border congestion and price divergence. This example illustrates that, in theory, it is possible to carry out long-term gas sales deals without holding physical cross-border capacity, if the risk of congestion can be hedged with FTRs.

In reality we see two related problems why this might not work in the gas market. First, as we noted in section 2, relative to electricity markets cross-border flows in gas are very large. In some

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<sup>57</sup> We use the term PTR in this section to differentiate from Financial Transmission Rights or FTRs. PTRs give the holder the right to physically transport gas. FTRs give the holder the right to any congestion rents that arise, but do not allow physical gas transport.

<sup>58</sup> FTRs are used particularly in power markets which use Locational Marginal Pricing –so-called LMP markets. LMP markets are quite common in North America. In Europe, FTRs are used in the Nord Pool Spot market.

countries, transit flows equal or even surpass the level of demand within the country. Trying to buy and sell such volumes on OTC markets or on an exchange could be very challenging. Essentially the TSO would probably act as the buyer of the gas, and then transport it across the border using the market coupling mechanism. But this would leave the TSO trading enormous volumes of gas, an activity to which it is not well suited, as well as facing counterparty risk.

The second, perhaps even more significant problem, is that it is not clear that FTRs can work in gas markets. In electricity markets, there is a single market price on either side of the border on which the FTR payout is based. In gas markets, each transaction has its own price – there is no appropriate reference price. Even if the TSO calculated FTR payouts according to average prices on either side of the border, this would still leave the seller in our example above exposed because the prices in their specific transactions might differ from the average price. Returning to the example above, recall that the gas seller sold at 19 in country A and bought at 22 in country B. But suppose that the average price in country A was 19.5, and the average price in country B was 21.5. The FTR payout would be only 2, which would wipe out the seller's profit from the deal.